IRON & COAL

THE IRON AND COAL TRADES' REVIEW

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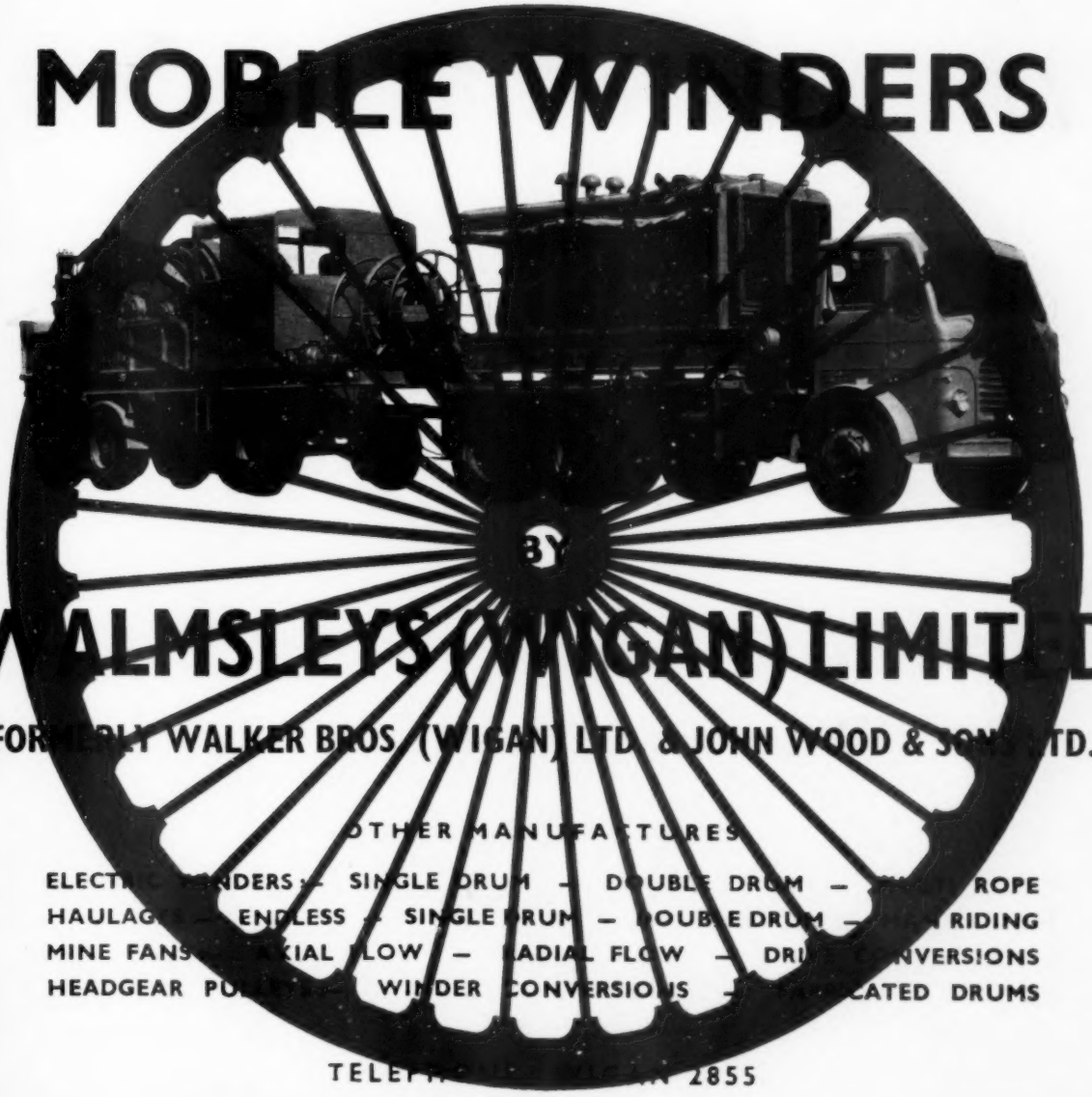

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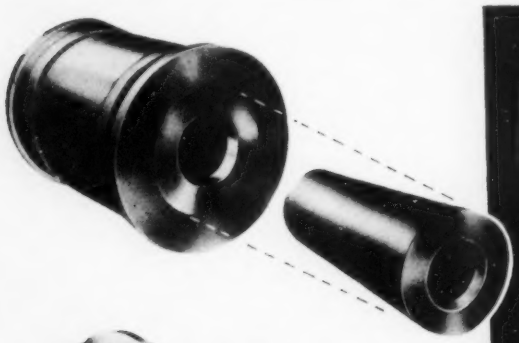

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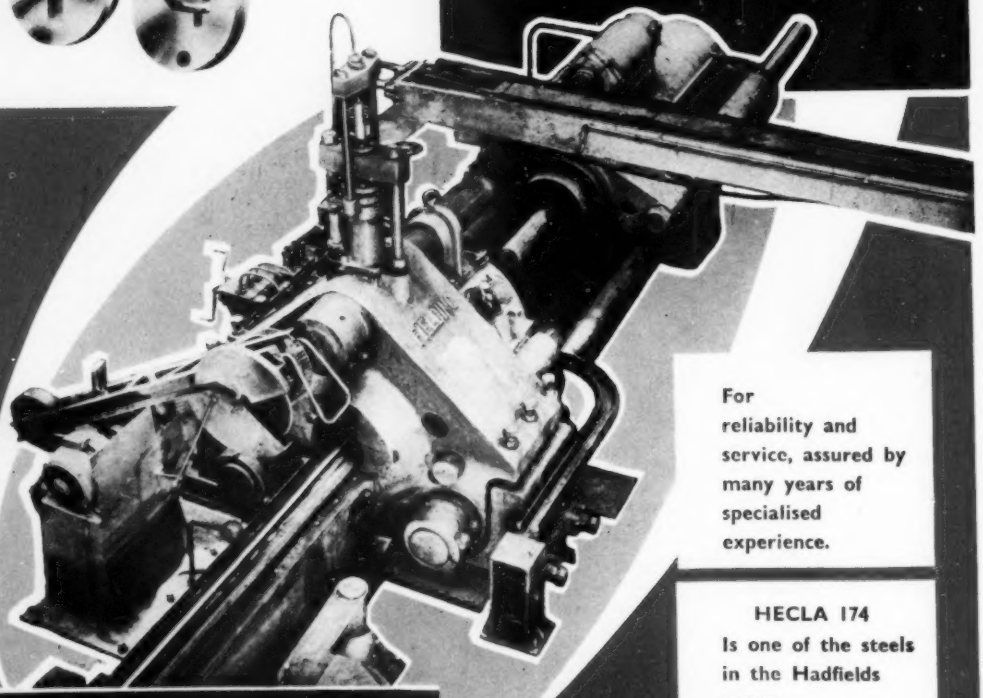

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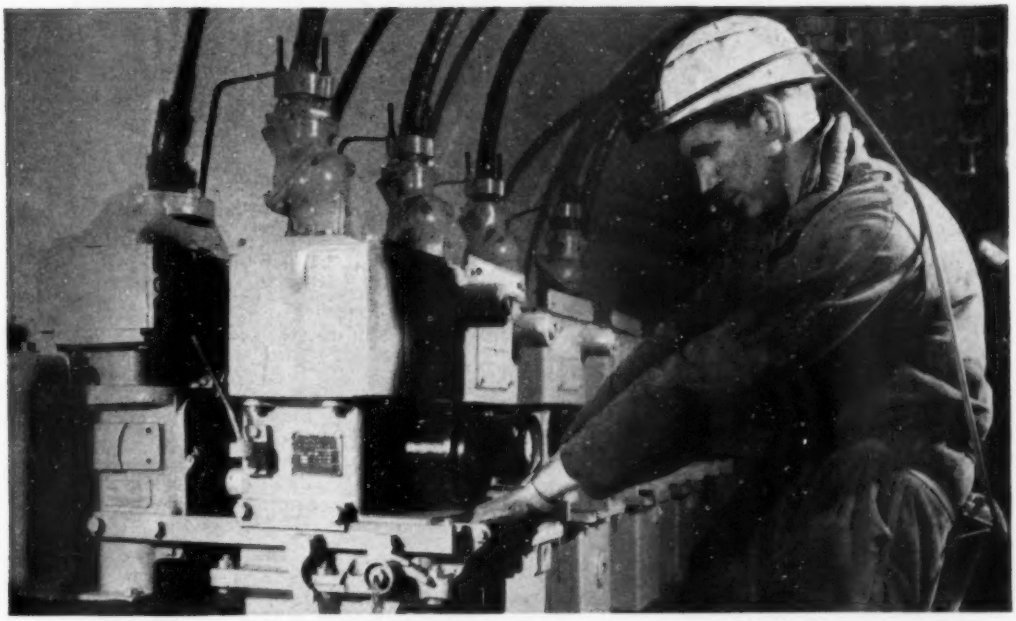

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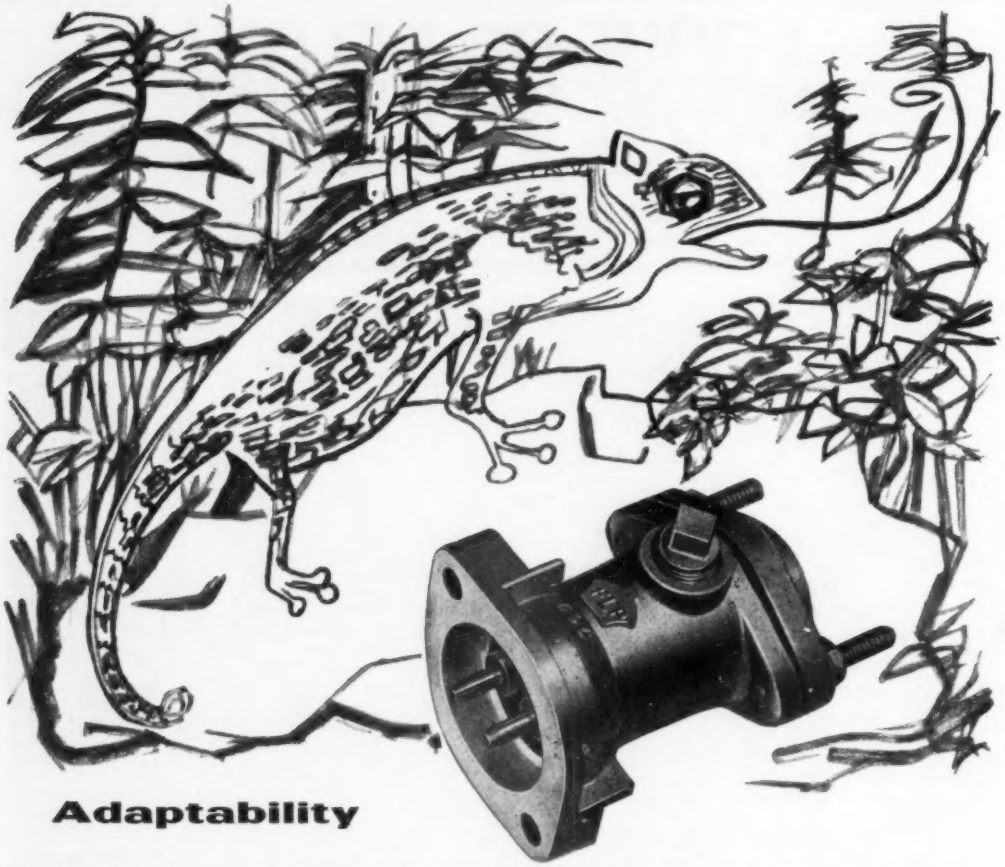

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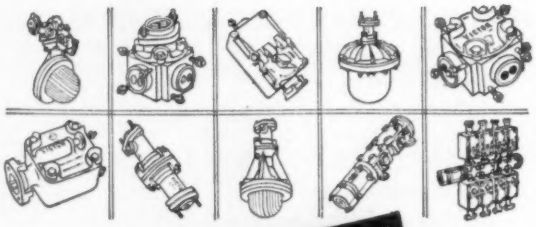

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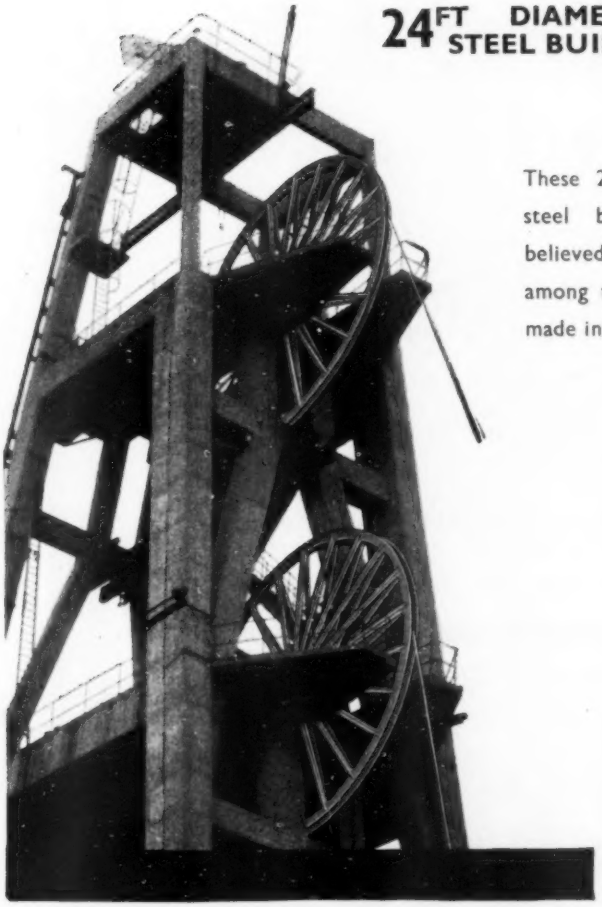

These 24ft. diameter welded steel built-up pulleys are believed to be the largest and among the first of their type made in this country.

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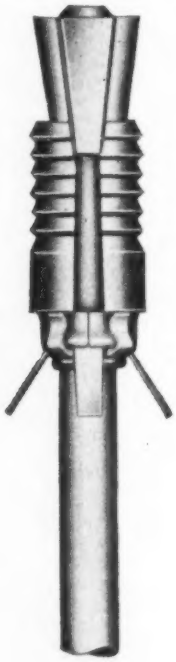

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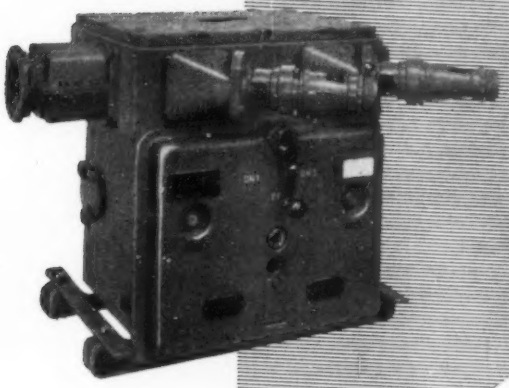

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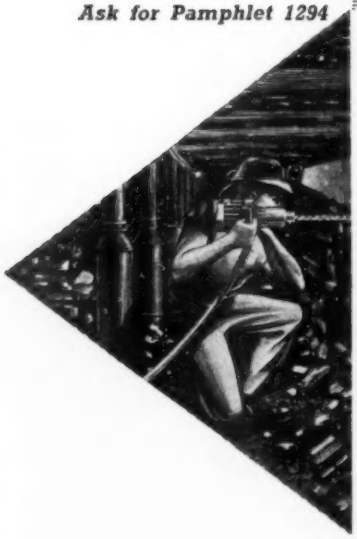

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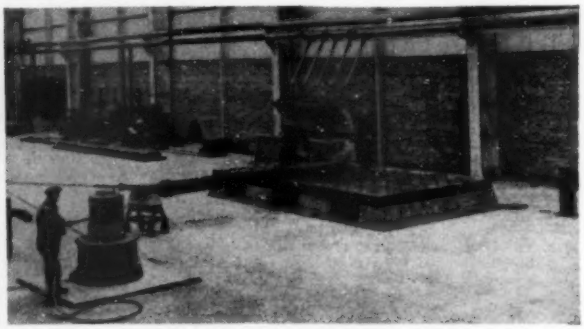

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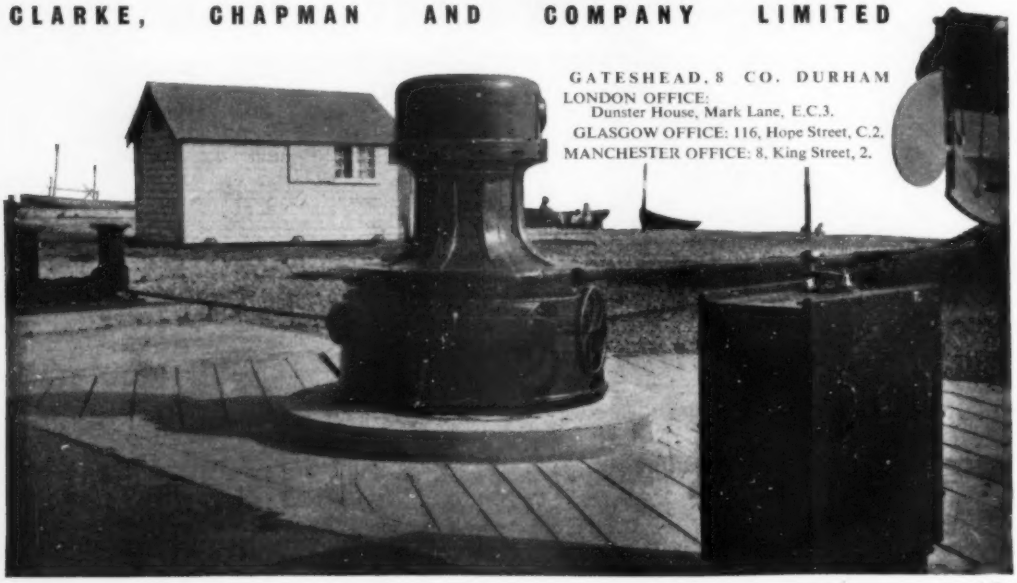

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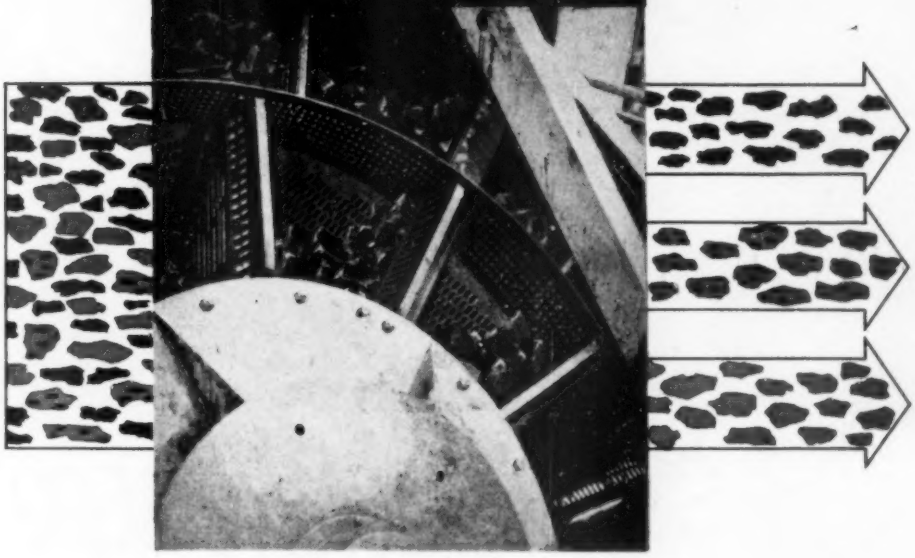

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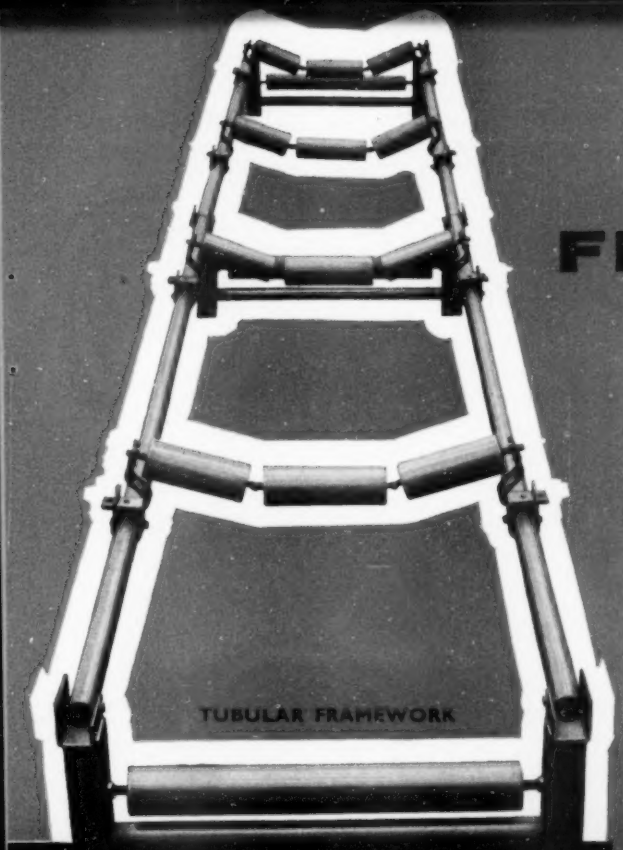

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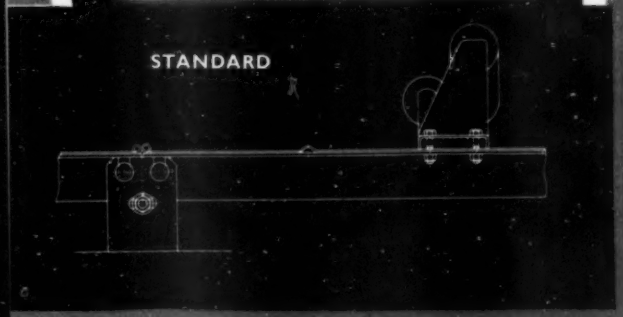

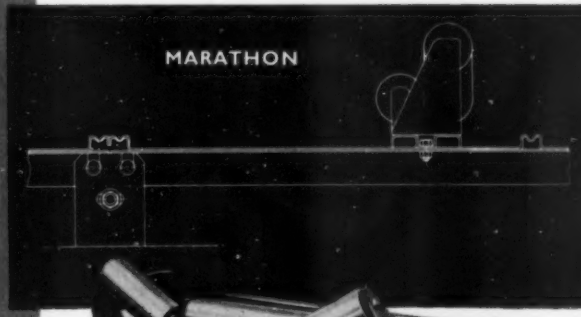

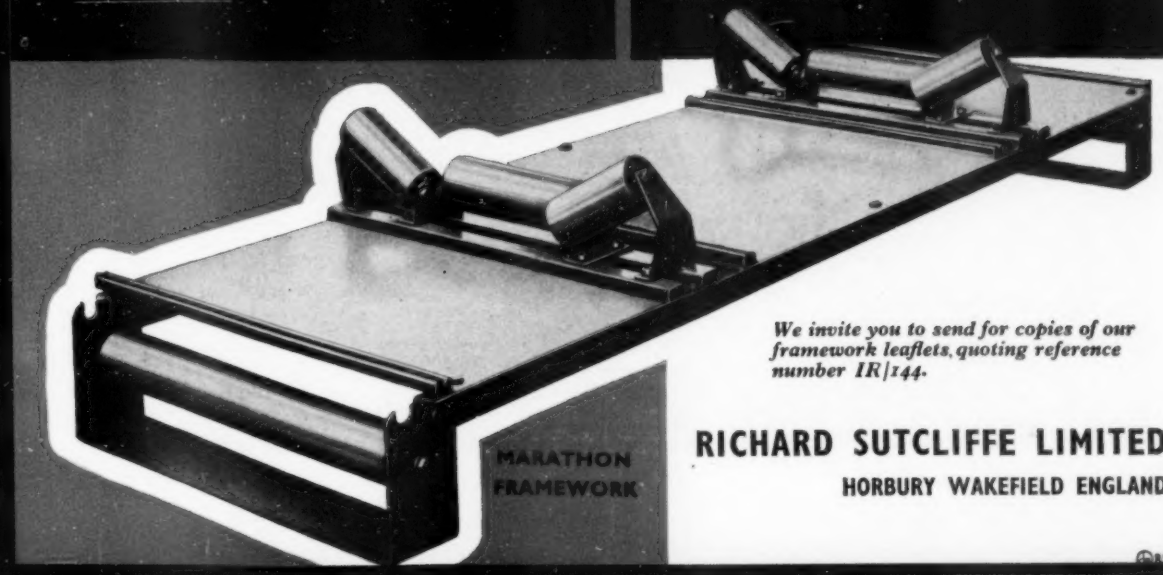

We invite you to send for copies of our framework leaflets, quoting reference number IR/144.

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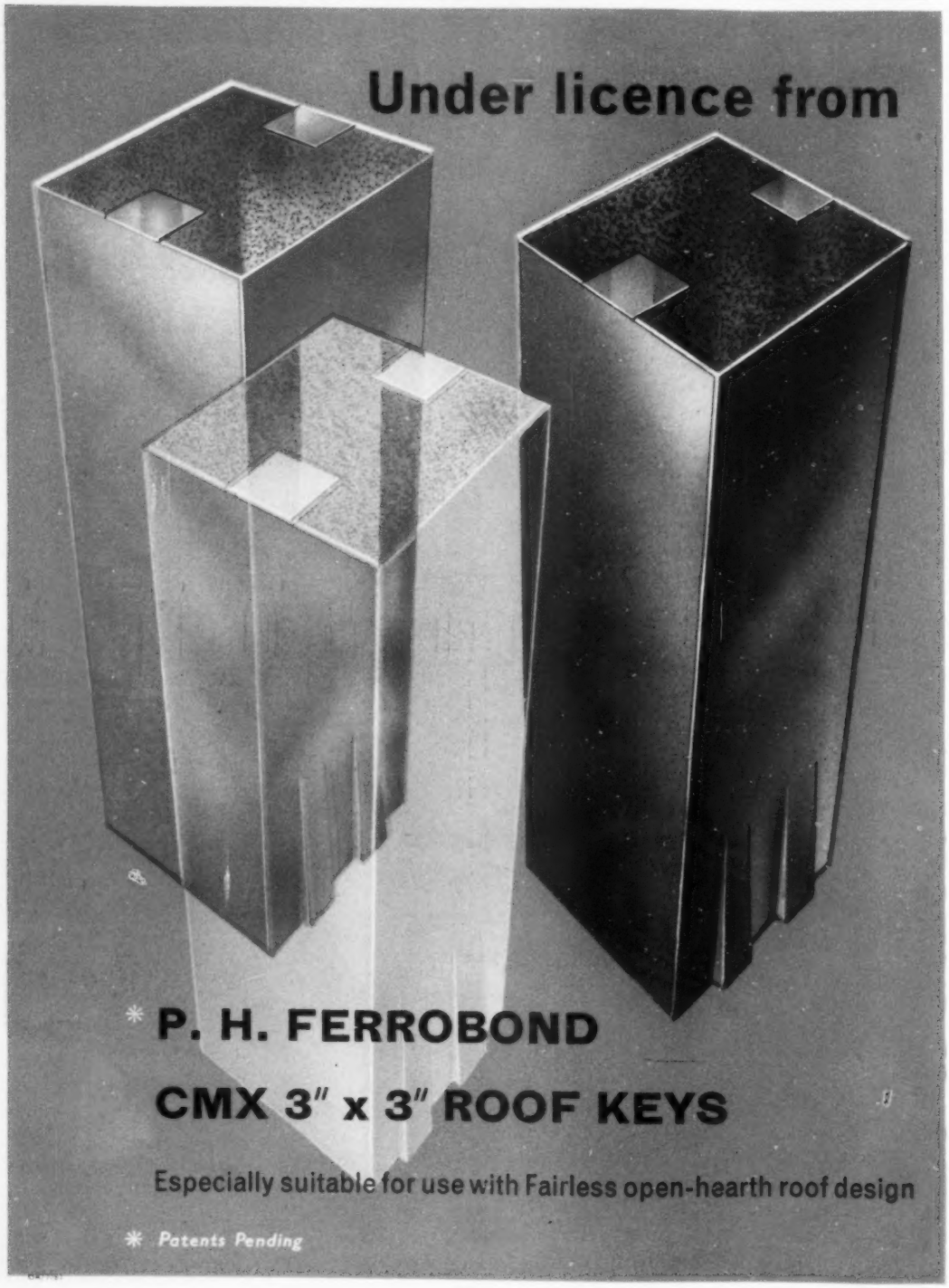
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190 Tons	12" Rib 9" Valley	284 Heats 112 Days	54,000 Tons	20	1.9%	1.8%	2
190 Tons	12" Rib 9" Valley	258 Heats 75 Days	47,500 Tons	26	2.2%	12.8%	2
190 Tons	All 12"	405 Heats 130 Days	77,000 Tons	25	62%	67%	2
200 Tons	15" Rib 12" Valley	488 Heats 196 Days	100,000 Tons	21	2.8%	6.8%	NONE
345 Tons	15" Rib 12" Valley	453 Heats 170 Days	157,000 Tons	38.5	10.4%	19.8%	2
400 Tons	15" Rib 12" Valley	298 Heats 186 Days	120,000 Tons	27	NIL	NIL	2

This chart shows comparative performance records in North America of six typical open hearth roofs. In each case the roof was constructed half-and-half of Lavino Ferrobond CMX 3" x 3" Roof Keys and Internally Plated 4½" x 3" Roof Keys. All were of the Fairless type roof construction (hold-up, hold-down). Production rate of tons per hour is based on total production over campaign time, and includes repair times, fettling times, and all lost time whatever the cause.

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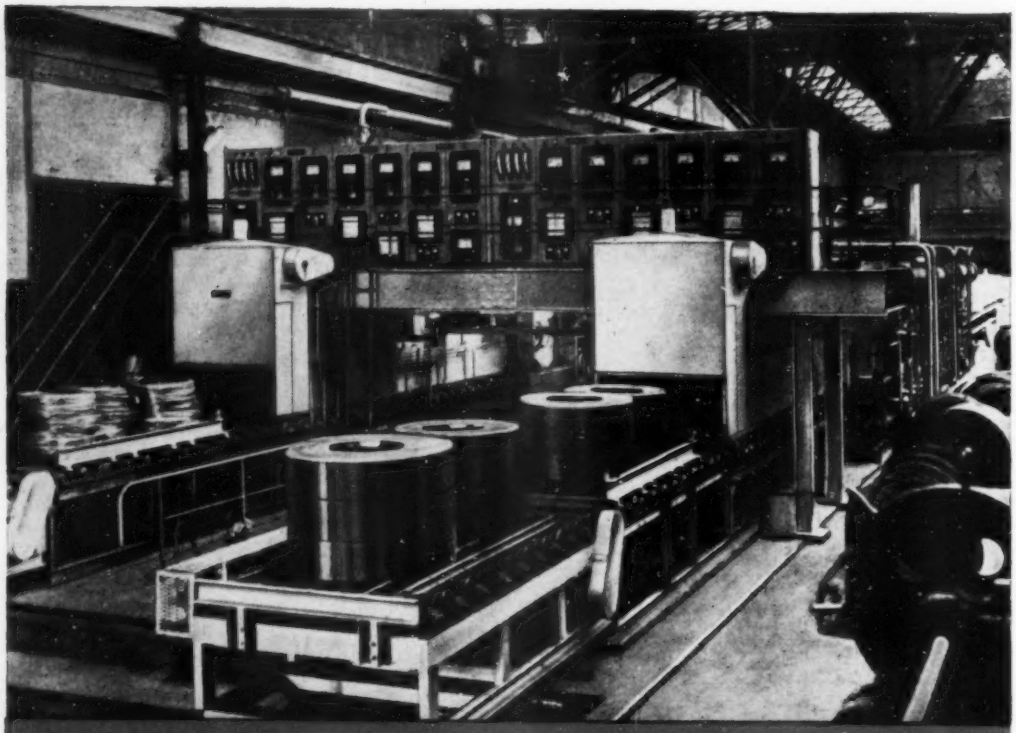

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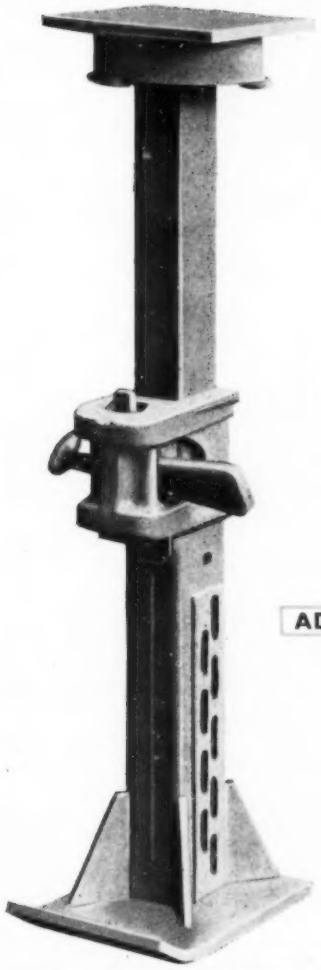

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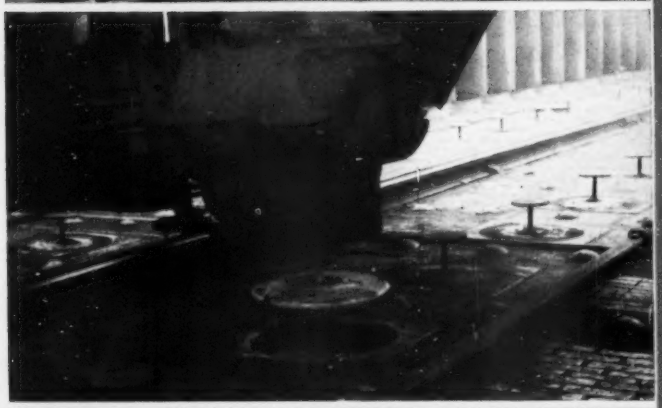

SMOKELESS CHARGING

Coke Ovens can be charged Smokelessly by the W-D Sequential System and equipment with a single control panel operating lid lifting, coal charging and lid replacement.

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British Patent Application Nos. 36424/59 · 43573/59 · 35540/57

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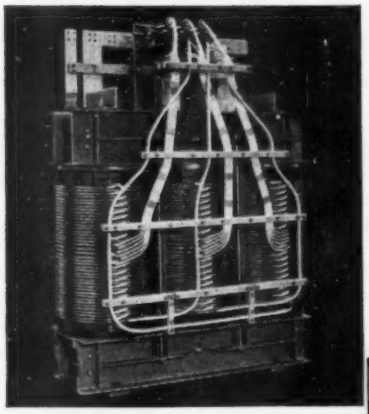

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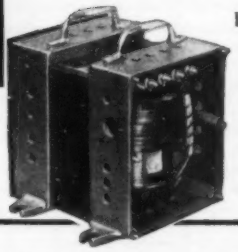

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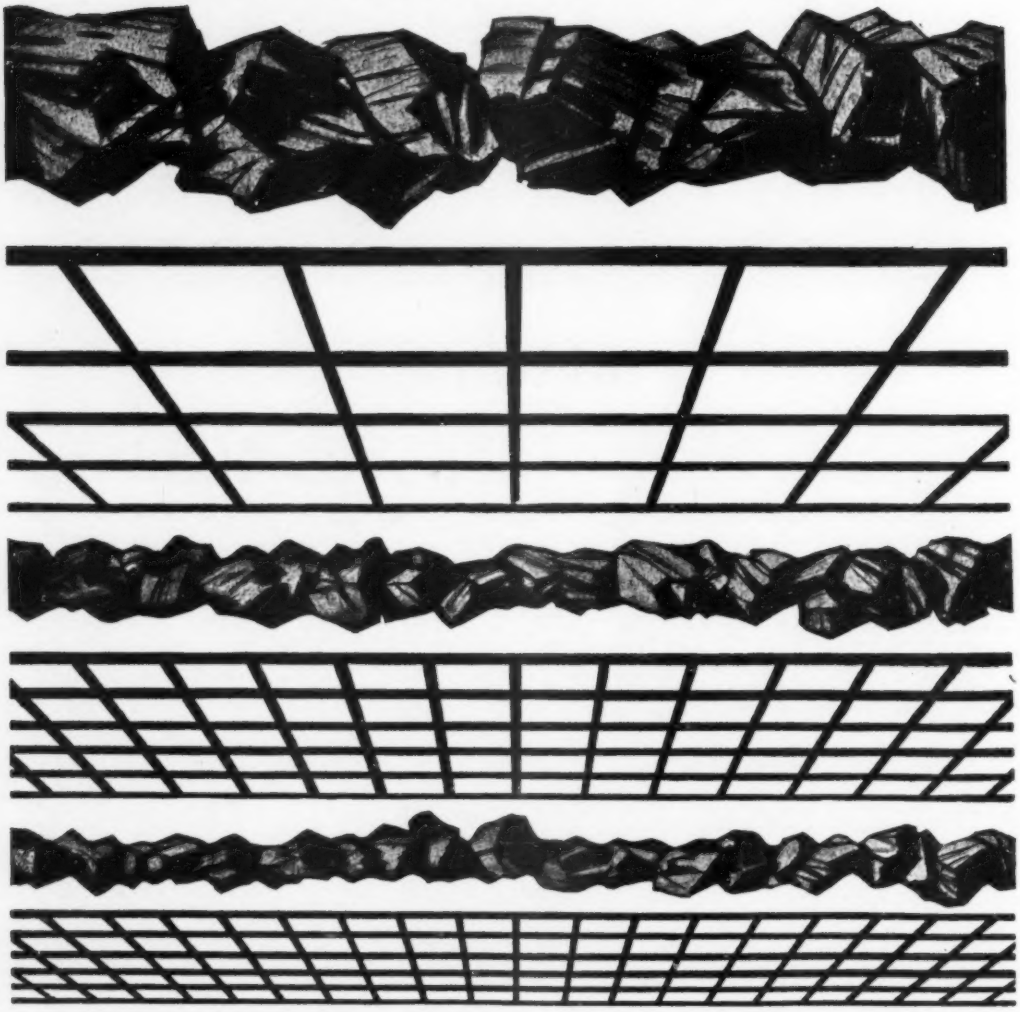

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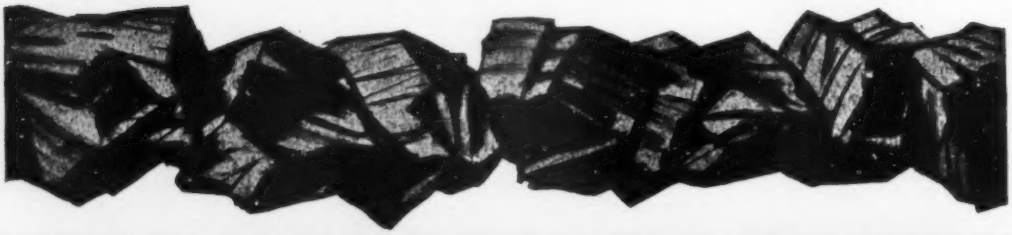

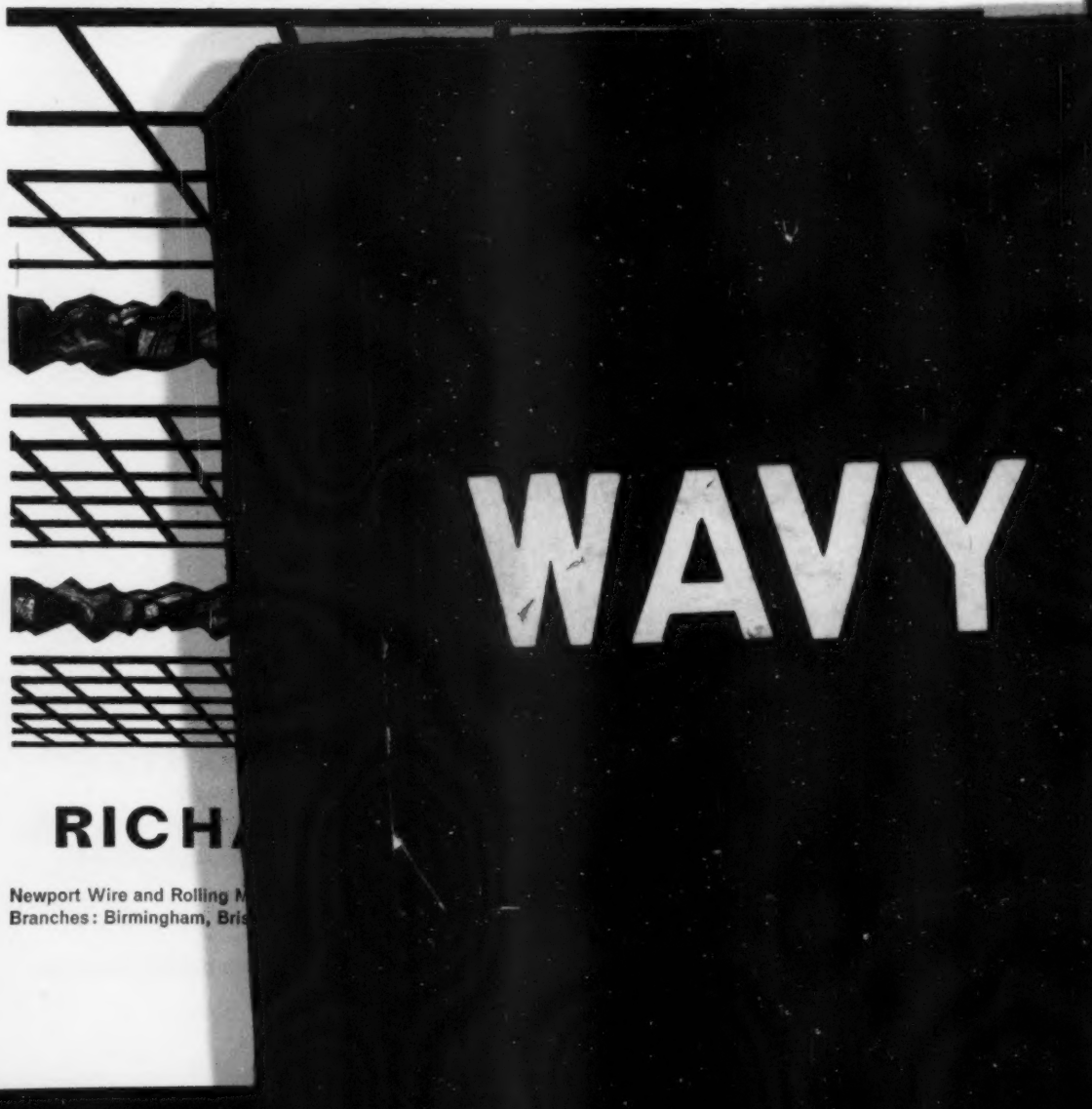

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Newport Wire and Rolling M
Branches: Birmingham, Bris

Coolers

VISCO design and supply Water Coolers of many types, including natural and forced draught recirculating systems.

Fume Removal

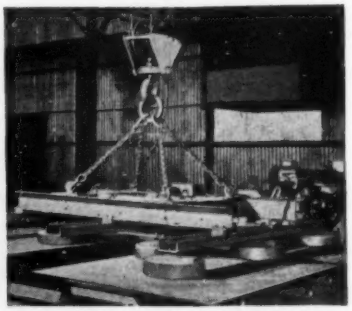
Water Coolers, Fume

PAGES

WITTON-KRAMER ELECTRIC MAGNETS

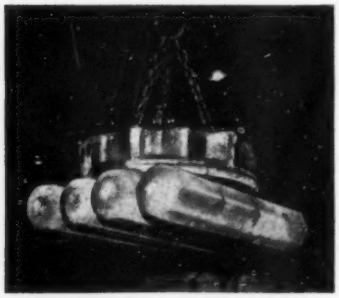
FOR ALL LIFTING PURPOSES

There are Witton-Kramer lifting magnets of all types to help you reduce your handling costs. Modern design and robust construction ensure their long life under severe operating conditions. That is why so many are being supplied for such a variety of duties.



A group of lifting magnets at the Manor Works of Joseph Sankey & Sons handling plates for the magnet yoke of a 7000 MeV proton-synchrotron.

Lifting pig iron at Round Oak Steelworks Ltd.



Lifting four ingots at the works of Taylor Brothers & Co. Ltd., Trafford Park. The total lift is about 13,440 lbs.

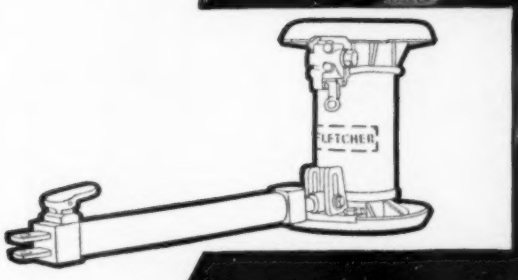
RELY ON THE EXPERIENCE OF G.E.C.

THE GENERAL ELECTRIC CO LTD OF ENGLAND · WITTON-KRAMER DIVISION · BIRMINGHAM 6

389

FLETCHER DESFORD CHOCKS

in action



Photograph by courtesy NCB

Following successful installations in the East Midlands Division, the Fletcher Desford hydraulic chock has gained a reputation for reliability.

50 and 100 ton versions: 6″ to 18″ stroke at 2″ intervals.

Fully approved by N.C.B —H.15 and H.11.

Ancillary equipment by Fletcher includes:

double-acting hydraulic ram up to 2′-6″ stroke

detachable ram anchor brackets

extension pieces 6″ & 12″

Full technical information from

GEORGE FLETCHER & CO. LTD., Masson Works, Litchurch Lane, DERBY · Telephone: Derby 45817 · Telex 37514

When this mill is finished our capacity is going to be bigger - and so is our biggest billet

From this mill will come low alloy and special carbon steels, including silico-manganese, in billet sizes up to 7" square

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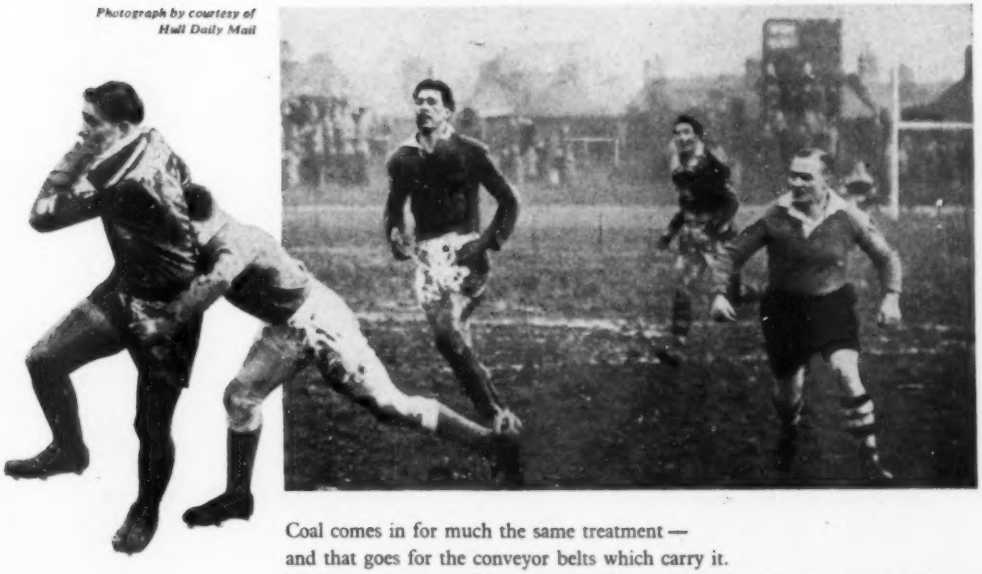
Branch of GKN Steel Company Limited

BRYMBO, NR. WREXHAM, DENBIGHSHIRE

ROUGH TOUGH HANDLING...

Rough, tough handling — that's the way they treat 'em in Rugby League.
There's no quarter given, and none asked,
but this does not deter stars like Great Britain's John Whiteley
from giving consistent, top-class performance.

Photograph by courtesy of Hull Daily Mail



Coal comes in for much the same treatment —
and that goes for the conveyor belts which carry it.
That's why the new Fenner Diamond range of belting has been developed:
to stand up to the never-ending scrimmages of colliery life:
to maintain vital handling movements and to score
production points even under the wettest conditions.

Fenaplast

DIAMOND TYPE COLLIERY CONVEYOR BELTING

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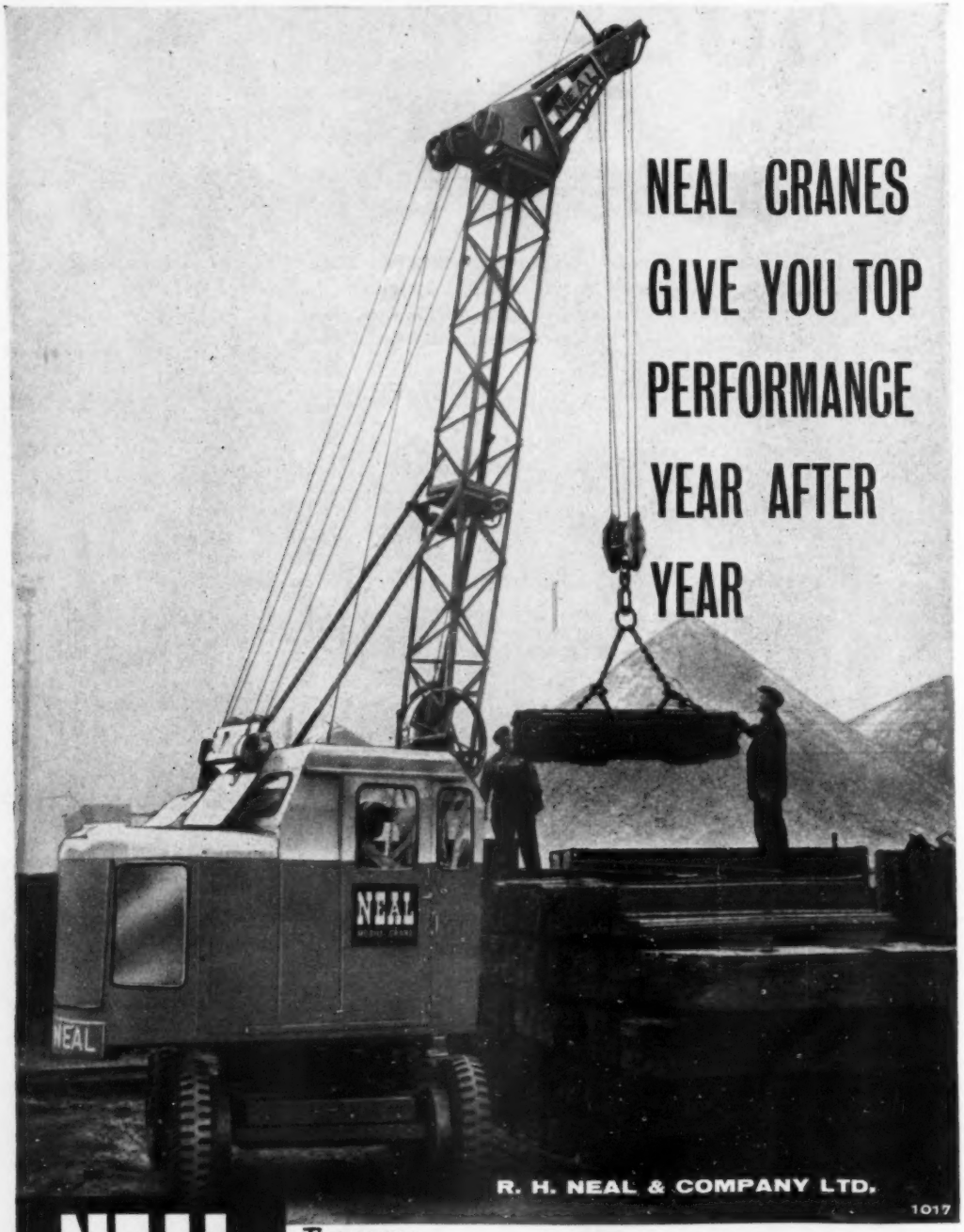
WE ARE EXHIBITING

A PRODUCT OF
J. H. FENNER & CO. LTD. HULL

LARGEST MAKERS OF V-BELT DRIVES IN THE COMMONWEALTH

FACTORIES OVERSEAS IN AUSTRALIA, INDIA AND SOUTH AFRICA



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STEEL HOUSE, EASTCOTE, MIDDLESEX.
SALES AND SERVICE: LONDON, BRISTOL, BIRMINGHAM, MANCHESTER, LEEDS, NEWCASTLE, GLASGOW.

A MEMBER OF THE STEEL GROUP OF CRANE AND EXCAVATOR MANUFACTURERS.

THE ASSOCIATION OF CRANE MAKERS
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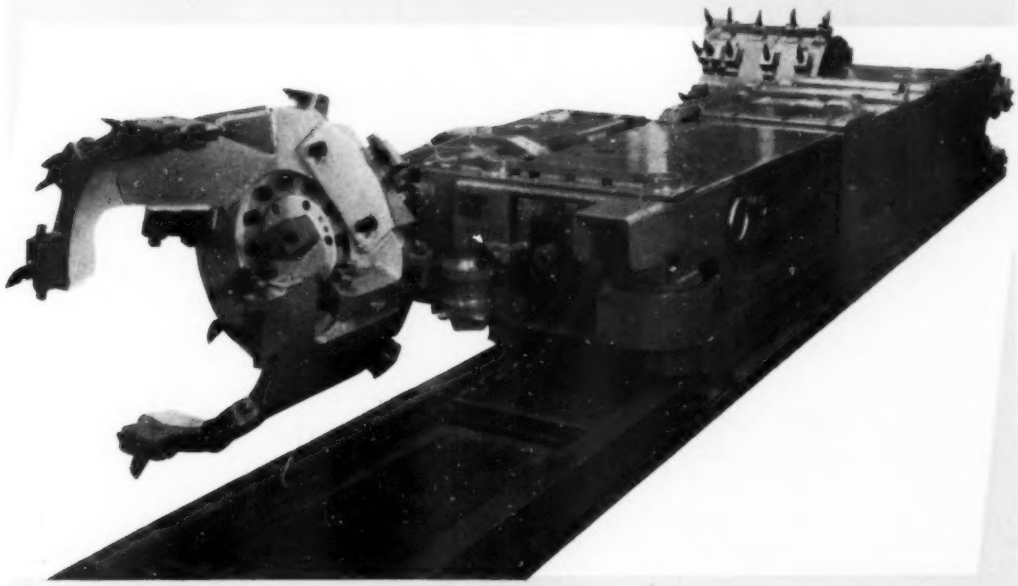
A far better product



The percentage of round coal produced by the BJD Trepan Shearer can be of the order of 40%, with a welcome reduction in the percentage of fines. The head cuts a circular web of coal and the shearing drum removes top and bottom coal. It's as simple as that.

Incidentally, if seam conditions deteriorate and an Anderton Shearer-Loader is called for, removal of the trepan unit converts the machine to a standard shearer.

BJD **TREPAN SHEARER**

BRITISH JEFFREY-DIAMOND LTD, MINING DIVISION WAKEFIELD YORKSHIRE

WF 5282

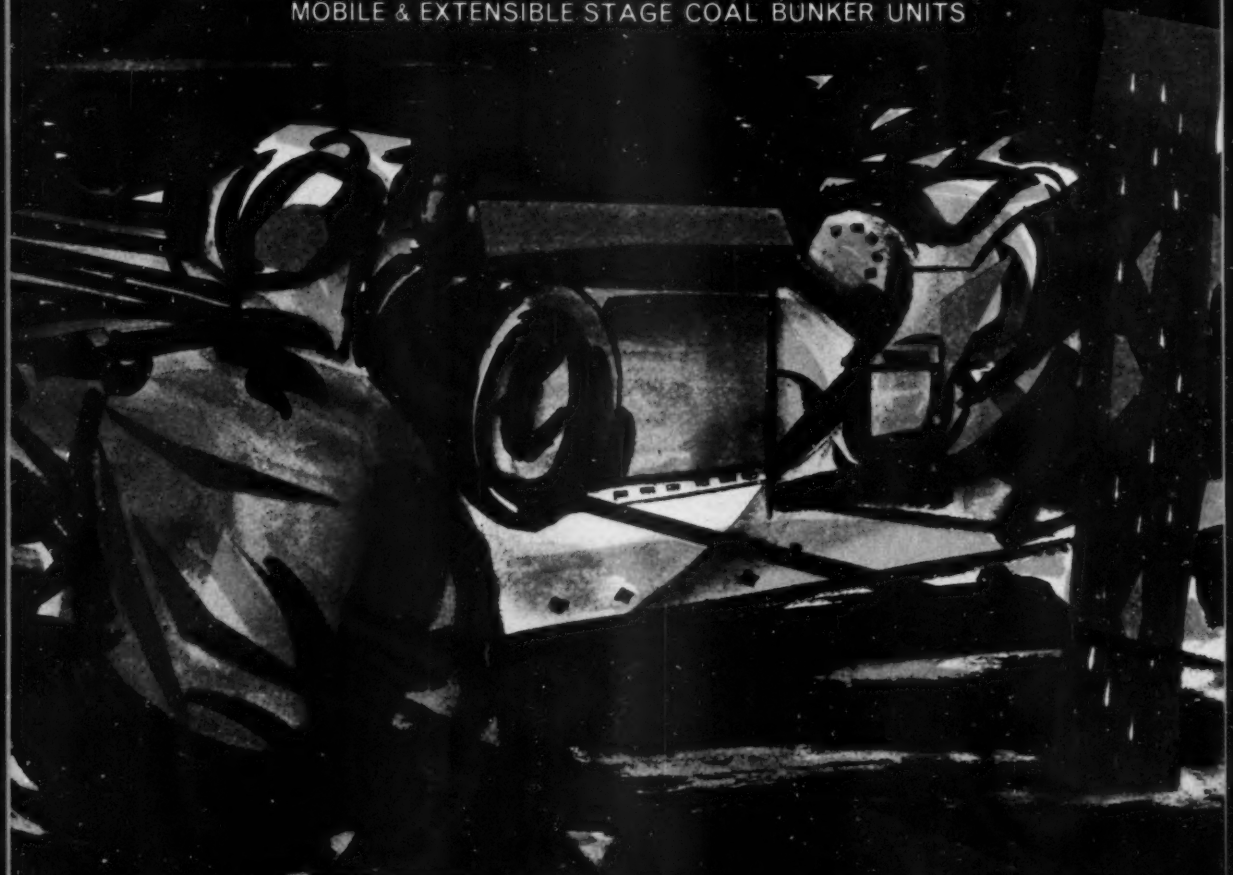
2

CRAWLEY

MINING EQUIPMENT

Crawley thin seam mining equipment includes:—

CRAWLEY-WILCOX CONTINUOUS MINERS · MOBILE BUNKER CONVEYORS
CRAWLEY MIDGET MINERS · MOBILE STAGE LOADERS
LO-HITE ARMOURED SNAKING CONVEYORS · MOBILE STAGE FEEDERS
HEAVY DUTY SNAKING CONVEYORS · EXTENSIBLE STAGE LOADERS
STATIONARY BUNKER CONVEYORS · EXTENSIBLE TUB LOADERS
MOBILE & EXTENSIBLE STAGE COAL BUNKER UNITS



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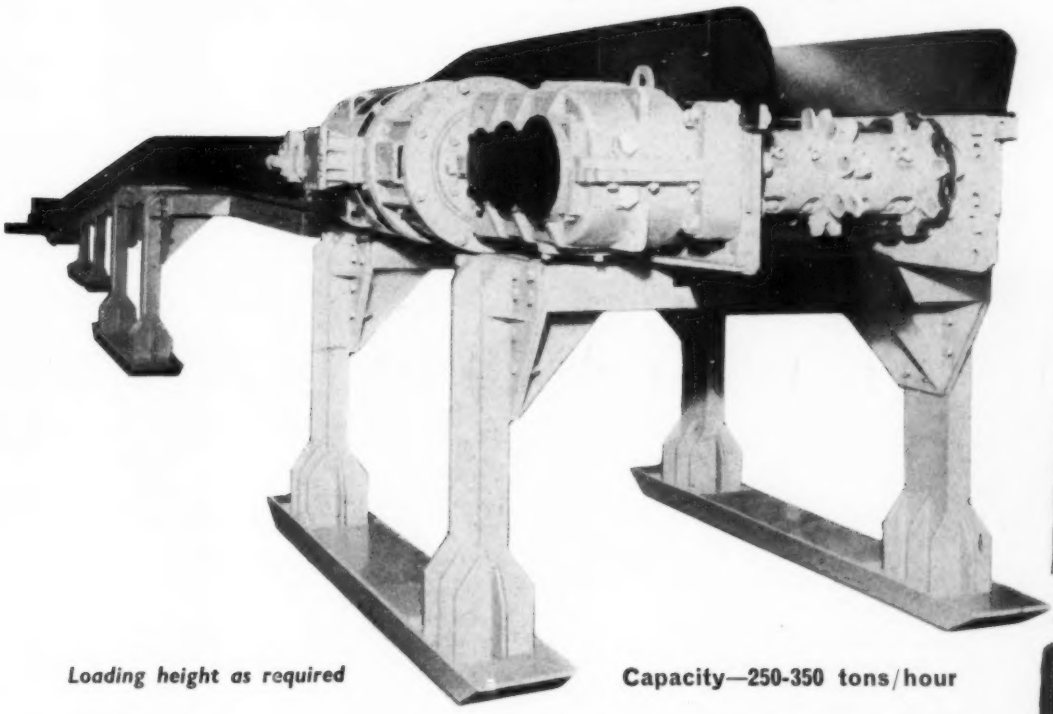
THE CRAWLEY HEAVY DUTY SKID MOUNTED STAGE LOADER



Loading height as required

Capacity—250-350 tons/hour

Overall width—

Extra Heavy Duty Extensible Stage Loader, treble strand 18-mm. chain .. .. 30 in. & 36 in.

Heavy Duty Extensible Stage Loader, double strand 18-mm. chain .. .. 24½ in.

Lo-hite Extensible Stage Loader, double strand 13 or 14-mm. chain .. .. 24½ in., 30 in. & 36 in.

Designed basically to deal with the problem of extension of plate belt conveyors, so that the equipment gives the minimum coverage over the discharge unit, but is extensible by the addition of pans and chains up to an overall length of 150 yards, thus avoiding frequent and expensive extensions to the plate belt conveyor, and can be supplied with N.C.B. recommended drive frame and gear box at request.

All Crawley Heavy Duty Machines have the following units standard and interchangeable:

Drive Frame · Gear Box · Gear Assemblies · Extension Sections · Structure · Tail Unit · Chain Flights

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CARMARTHENSHIRE · S. WALES · Tel: Llanelly 4233

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CRAWLEY

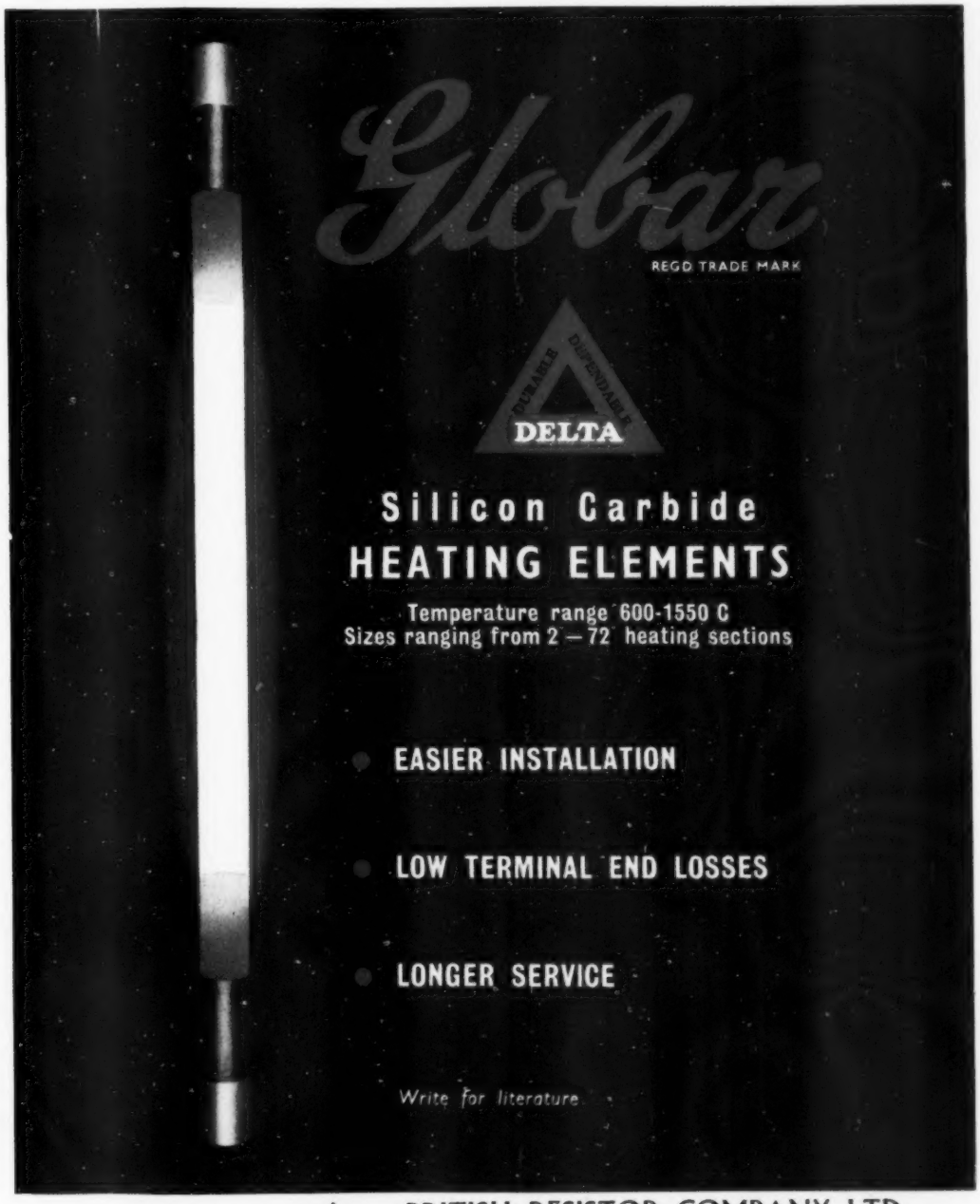
The HEELEY SHEAR DRUM *with* HIGHER SPEED METALS PICKS

★ FASTER HAULAGE SPEEDS
★ A MINERS PICK, MECHANISED
★ AMPERAGE DOWN
★ LARGER COAL
★ LESS RECIRCULATION
★ THE ONLY DRUM WITH PICK POINT ATTACK
★ A HIGHER PERCENTAGE OF COAL DEPOSITED ON CONVEYOR

A Product of the

HEELEY (MINING MACHINERY) CO LTD.
NUNNERY COLLIERY, WOODBOURN ROAD,
SHEFFIELD, 9

Telephone: 22836



Globar Regd DELTA

BRITISH RESISTOR COMPANY LTD.
MILL LANE RAINFORD ST. HELENS
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INBYE BUNKERING

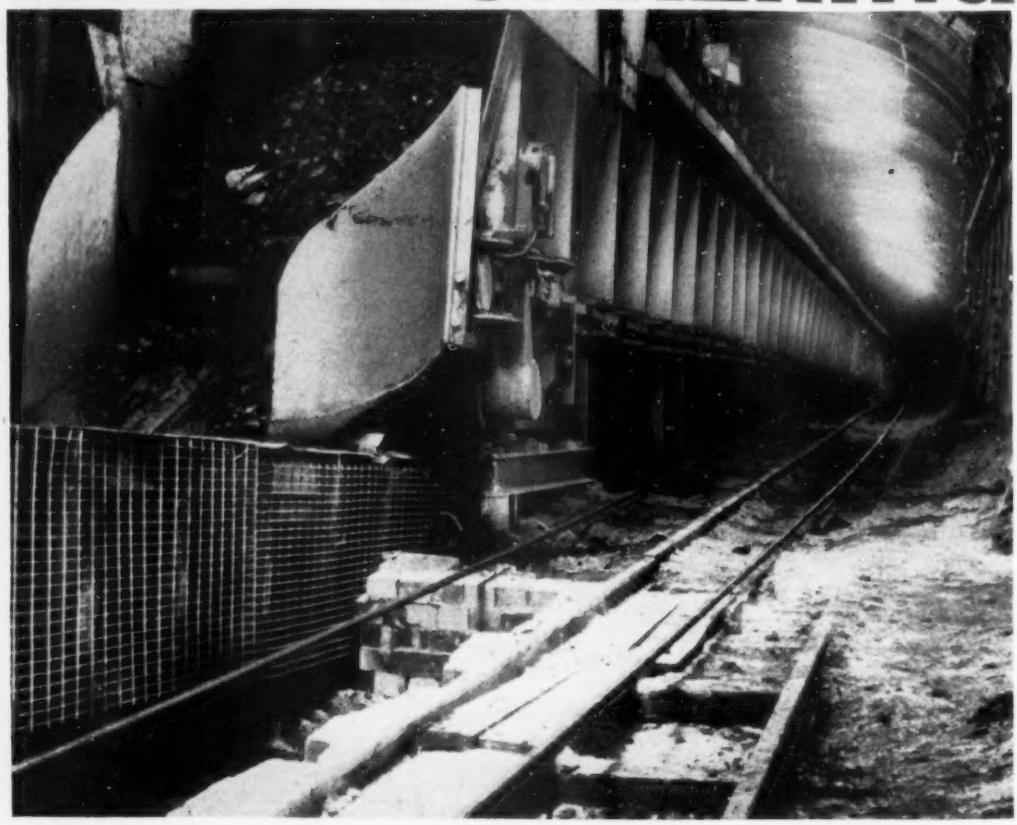


Photo by courtesy of N.C.B. **A COWLISHAW WALKER BUNKER INSTALLATION AT A COLLIERY IN THE WEST MIDLANDS**
The picture clearly shows the cushion of small coal down which the lumps flow with minimum degradation

A suitably placed bunker allows coal production on the face to proceed uninterruptedly in spite of minor transport stoppages outbye.

Method study has shown that an efficient bunker can iron out such stoppages which in total may represent as much as 15% of the working shift. The obvious place to locate the bunker is as near the coalface as possible and so the COWLISHAW, WALKER BUNKER CONVEYOR has been expressly designed for inbye application. It is compact, simple and particularly easy to operate. The gate or trunk belt may feed the bunker in line with the bunker axis as shown in the photograph or from the side.

COWLISHAW WALKER & CO. LTD
BIDDULPH, STOKE-ON-TRENT · PHONE: BIDDULPH 3254
LONDON OFFICE: 117 VICTORIA STREET, WESTMINSTER, S.W.1 · VICTORIA 5472

You shouldn't use one

without the other!

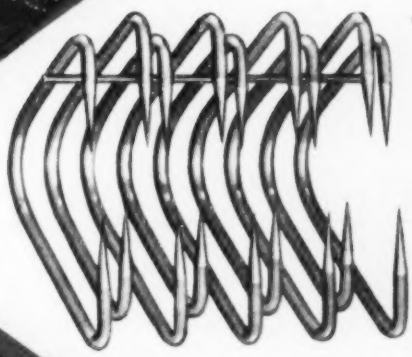
YOU'LL GET THE MOST OUT OF THE PREMIUM GRADE BELTINGS WHEN YOU USE THE COMET P.15 FASTENER

It's obvious — you only get your money's worth out of the new high-tensile beltings when your joints match up to the strength of the belt itself.

And experience has *proved* that the Comet P.15 fastener enables you to use *most* of the premium belt's extra strength.

Only Comet achieves that balance of wire diameter, leg and point lengths and pitch which together make the strongest, longest lasting joint available.

We don't say that the Comet P.15 fastener will use *all* of the premium belt's extra strength. We just know it uses most.



Comet

COLLIERY CONVEYOR BELT LACING SYSTEM

MASTABAR MINING EQUIPMENT CO. LTD.

AVENUE PARADE, ACCRINGTON, LANCASHIRE · TELEPHONE: 35411 (3 LINES)

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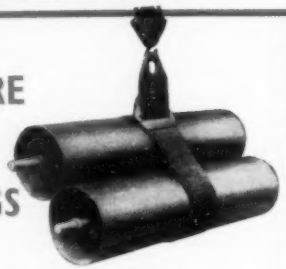
FELCO
LIFTING APPLIANCES

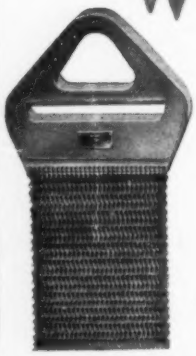
TRIPLE GEAR CHAIN BLOCKS

Short headroom. Light weight. Compact for high efficiency. Capacities from ¼ ton to 20 tons.

Sole Distributors For Wedco

WIRE BELT SLINGS



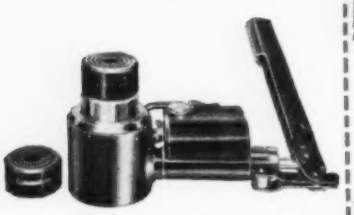


THE SLING WITH 1,000 USES

The "Wedco" wire Belt Sling has the strength of steel combined with maximum flexibility and a wide bearing surface giving exceptional load stability.
Made from thousands of strands of sturdy woven wire in a smooth transverse loop construction "Wedco" Wire Belt Slings cannot snap or tear. They are safer, easier to handle, faster to rig and will not whip, kink or tangle.
In the field of mechanical handling this is something you should know more about, write us for the fullest details.

RATCHET HOISTS

Incorporating a patented Overload Preventer giving greater security and safety to the operator, also reducing wear and saving cost of maintenance. A free-wheeling feature enables quick adjustment of unloaded chains.



LOW LIFT JACKS

Large capacity for use in confined spaces. Light enough for ONE MAN to use. Swaying under load eliminated by large diameter cylinder providing easy adjustment of height. Capacities from 10 to 30 tons.

BABY 60 ELECTRIC HOIST BLOCKS

BRITISH MADE

Patents Pending.
5 and 10 cwt. capacity. Light weight, compact and portable. Pushbutton control. Upper and lower overtravel limit switches. Supplied for any height of lift to suit requirements. Top hook suspension facilitates attachment to travelling trolleys or girder clamps, etc.

"ADJUST-A-LEG" EQUALISING SLINGS

Entirely new design giving TWO SLINGS IN ONE. Sling legs lock automatically when lifting starts. Saves labour, time and accidents. Capacities from 1 ton to 20 tons.

FELCO HOISTS LIMITED

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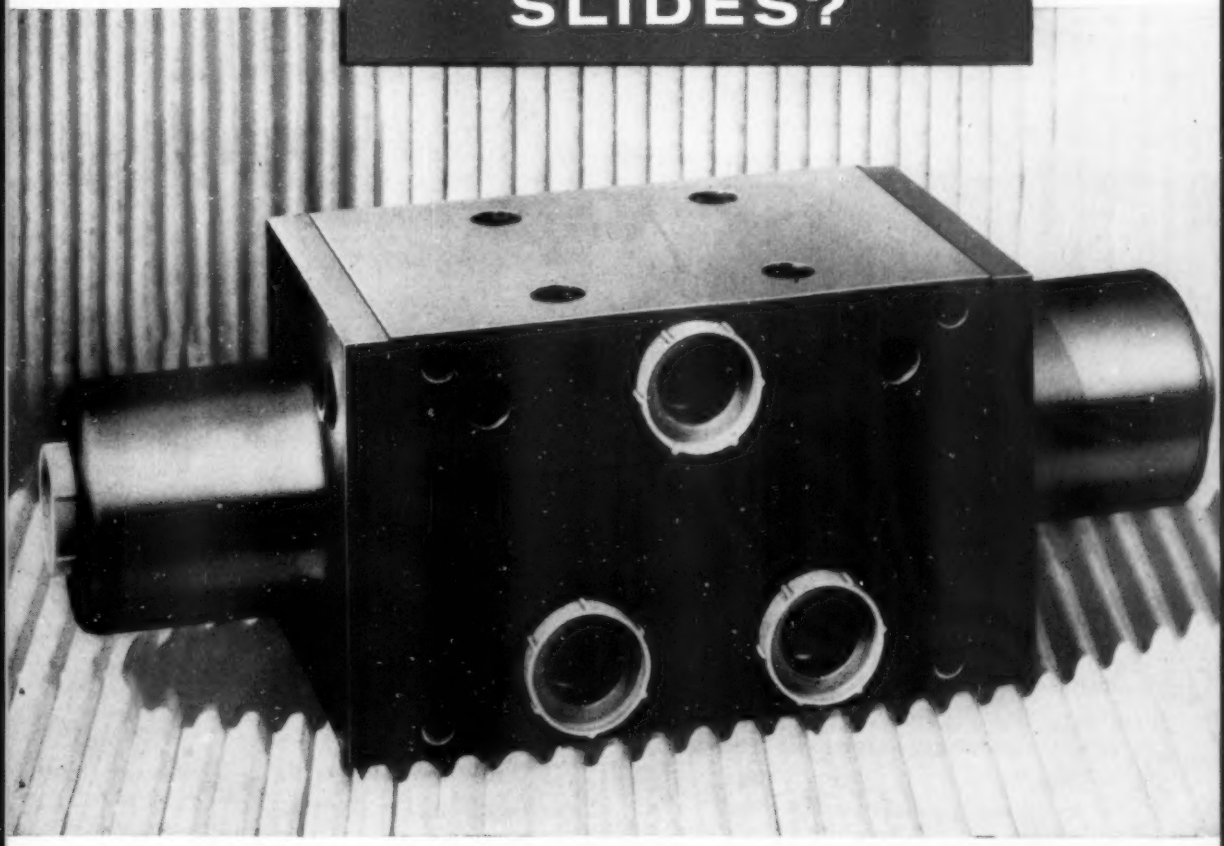
F3/60

THE HALLMARK QH OF QUALITY

why do AIR CONTROL VALVES

Patent applied for

have RECTANGULAR SLIDES?



It's not just a gimmick !

Q.H. AIR CONTROL VALVES incorporate a rectangular slide to give these important advantages —

- CONSISTENT OPERATION at low operating efforts because the air loading is fully balanced under all conditions.
- LESS AIR LEAKAGE because Q.H. Air Control Valves have a short leakage path.
- GREATER RELIABILITY by elimination of sealing rings, and the inclusion of individual filters in the inlet and outlet ports.

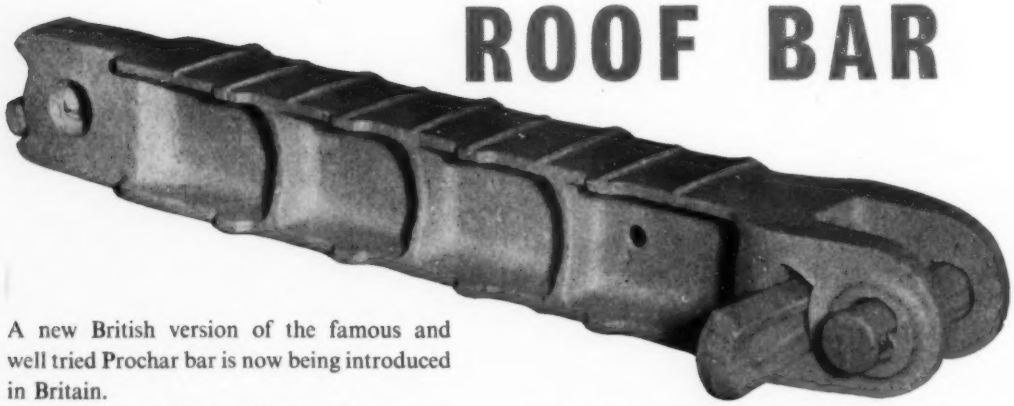
THE HALLMARK QH OF QUALITY

QUALTER HALL

setting new standards in Pneumatic Equipment

For further details write to: QUALTER, HALL & CO. LTD., P.O. Box 8, Railway Foundry, Barnsley

Introducing . . **THE NEW PROLLOY ROOF BAR**



A new British version of the famous and well tried Prochar bar is now being introduced in Britain.

It is being manufactured and marketed by LLOYDS (BURTON) LIMITED and is called the NEW Prolloy Roof Bar.

The new bar, fully approved by the National Coal Board, has been subjected to stringent tests on the surface and underground.

Many modifications and new ideas have been incorporated into the new design, all calculated to give better and more economical service where it is needed—underground.

For further details ask for the Prolloy Technical Engineers to call, or ask for the leaflet which gives brief details and specification of the NEW PROLLOY Roof Bar.

N.C.B APPROVAL No B. 17

MANUFACTURED & MARKETED BY

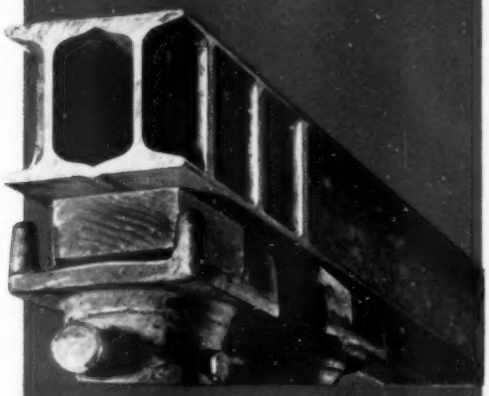
LLOYDS

(BURTON) LIMITED

WELLINGTON WORKS · BURTON ON TRENT

TEL. BURTON 5661 TELEX 34-365

WHERE CONDITIONS ARE TOUGHEST INCREASE WORKING EFFICIENCY AND SAFETY ...WITH THE 'PROLLOY' ROOF BAR



New improved all British version made from high tensile cast steel "I" section bar, has staggered ribs for extreme resistance to twist and crush. Combined with high joint strength, these features result in ability to carry considerable cantilever tip loads. This bar also features captive joint members which are *easily replaceable underground*, fully retractable wedge for *free articulation of joint*, and specially shaped *replaceable tongue*, which takes all male end wear.

"N.C.B. Approval No. B.17"

THE S.M.R.E. ROAD HEAD BAR

The S.M.R.E. bar—the first bar designed and manufactured for the support of Roadheads and Stables.

Designed by the Safety in Mines Research Establishment, to reduce fatal accidents and improve efficiency at roadheads and stables. The bar is manufactured from two special joists of high tensile steel to BS 968, giving an effective distribution of material over the cross section with the consequent improvement in its strength/weight ratio, and stability. The capabilities of this are fully exploited by hardening and tempering the welded bar under close control in modern furnaces. This produces in the finished bar, the optimum combination of strength and ductility at the low weight of **16·5 lbs./ft.**

The S.M.R.E. bar shows a greatly improved endurance compared with other sections in the same application. In some exacting installations, it has outlasted 6in. by 5in. R.S.J.'s, weighing **25 lbs./ft.** by at least 10 times without failure.

PMD

PROLLOY MINING DEVELOPMENTS LTD

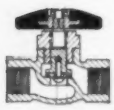
Pear Tree Lane, Dudley, Worcestershire. Telephone: Dudley 52431

Exclusive Manufacturing Facilities: Lloyds (Burton) Ltd. & Joseph Wright & Co. (Fabrications) Ltd.

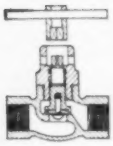
CONFLOW

CODE No. 7 MAXWAY VALVES

Straight-through hand wheel operated type



Straight-through hand wheel operated type.



Straight-through key operated type.

3-way hand wheel operated type.

3-way key operated type.

This compact, sturdy valve of proved reliability and efficiency affords long trouble-free service. It is designed for both hydraulic and pneumatic work up to 2000 p.s.i. although it has been rigorously tested to many times this recommended maximum working pressure. The body is in cast gunmetal to B.S. Specification and a robust stainless steel spindle is fitted. Useful features are, full bore which provides minimum impedance to flow, shock and fire resistant Neoprene handwheel.

Sizes available, $\frac{1}{4}$", $\frac{3}{8}$", $\frac{1}{2}$", $\frac{3}{4}$" & 1" bore, screwed B.S.P. Send for technical literature.

CONFLOW LTD

Valve Specialists

A MEMBER OF THE DARNALL INDUSTRIES GROUP

LENTON, NOTTINGHAM, U.K.

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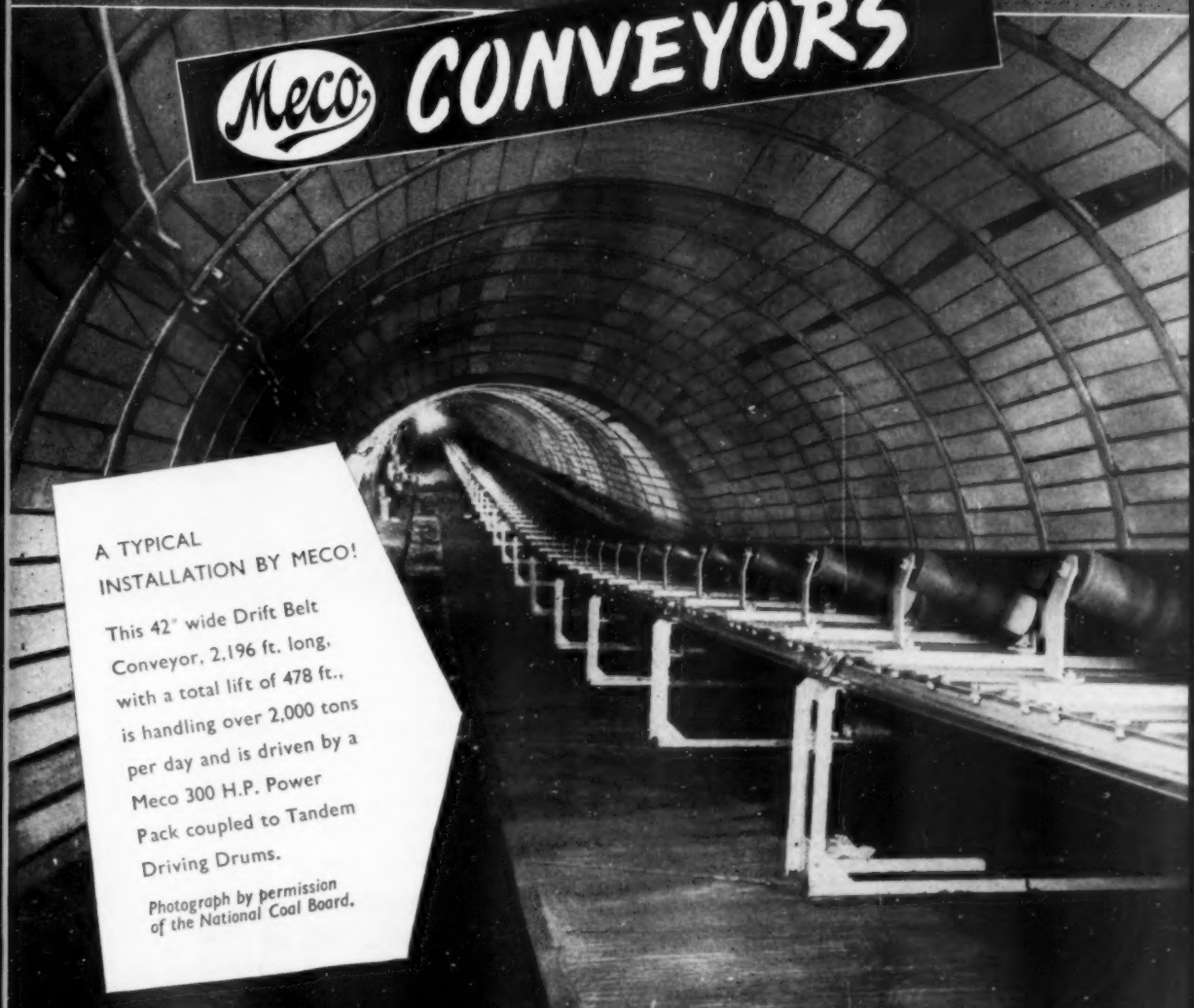
NOW! MAJOR DRIFT TRANSPORT BY—

Meco CONVEYORS



A TYPICAL INSTALLATION BY MECO!

This 42" wide Drift Belt Conveyor, 2,196 ft. long, with a total lift of 478 ft., is handling over 2,000 tons per day and is driven by a Meco 300 H.P. Power Pack coupled to Tandem Driving Drums.

Photograph by permission of the National Coal Board.

THE MINING ENGINEERING CO. LTD.,
MECO WORKS, WORCESTER, ENGLAND.

Telephone: Worcester 22291 (7 lines).
Telegrams: MECO Worcester.
London Office: 50 Pall Mall, London, S.W.1.
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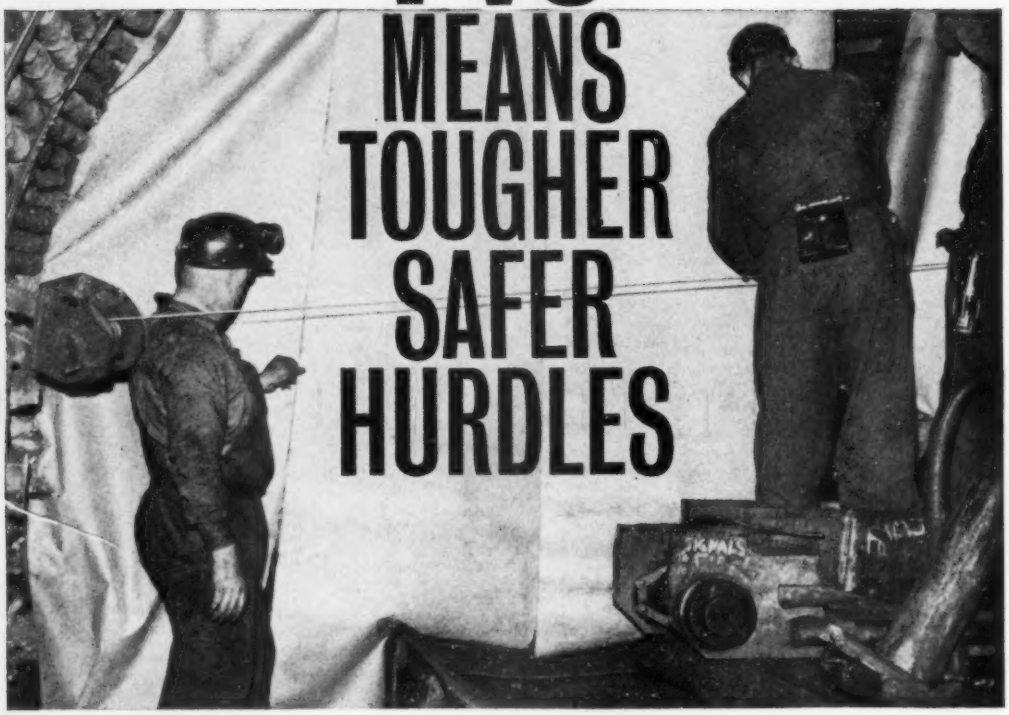
L.P. 210—110

Geon PVC MEANS TOUGHER SAFER HURDLES



Geon PVC's proven resistance to fire and hard wear makes it a welcome material in Britain's coal mines. Brattice cloth coated with this tough non-flammable PVC is being increasingly used for hurdles and ventilating doors — giving them longer working life and a higher safety factor. Geon PVC is also successfully used underground for conveyor belting, air ducting, cable sheathing, protective clothing. All of which goes to show that when a durable and flexible material is needed the safest thing to specify is Geon PVC.
For more information about it please write for Booklet No. 188.

Geon-coated brattice cloth is manufactured by Evans & Major, Dumballs Road, Cardiff, who invite direct enquiries. Photograph by courtesy of the National Coal Board.

Geon is a reg'd trade mark

British Geon Ltd A COMPANY IN THE DISTILLERS PLASTICS GROUP

Geon

SALES AND TECHNICAL SERVICE DEVONSHIRE HOUSE PICCADILLY LONDON W1 HYDE PARK 7321

Distillers Plastics Serve Everyman

Modern Coke Oven Machinery

Wellman Combined Coke Pusher, Coal Leveller and Door Extracting Machine, designed and constructed for The Stanton Ironworks Co. Ltd., to the order of the Woodall-Duckham Construction Company Ltd.

A unique feature of this machine is the lattice-braced ram beam which is designed to obviate distortion of the ram where uneven cooling conditions occur on exposed sites.

We supply full equipment for Coke Oven Batteries, namely: Coke Pushers, Coke Guide and Door Extractors, Coal Charging Cars, Coke Quenching Cars (fixed and tilting floor types), Clay Luting Lifts, Electric and Electro-hydraulic Locomotives.

THE WELLMAN SMITH OWEN ENGINEERING CORPORATION LTD.
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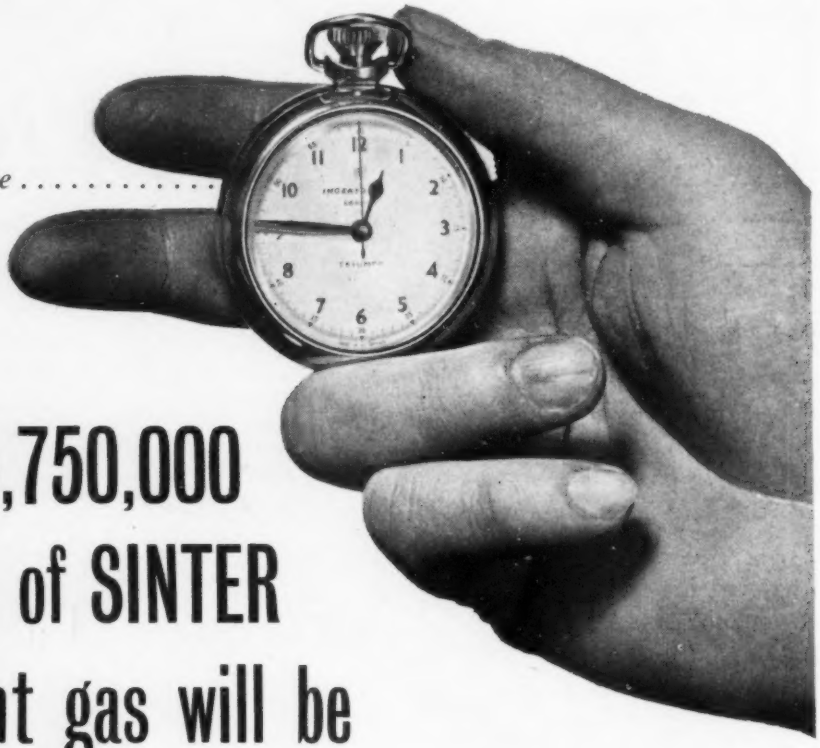

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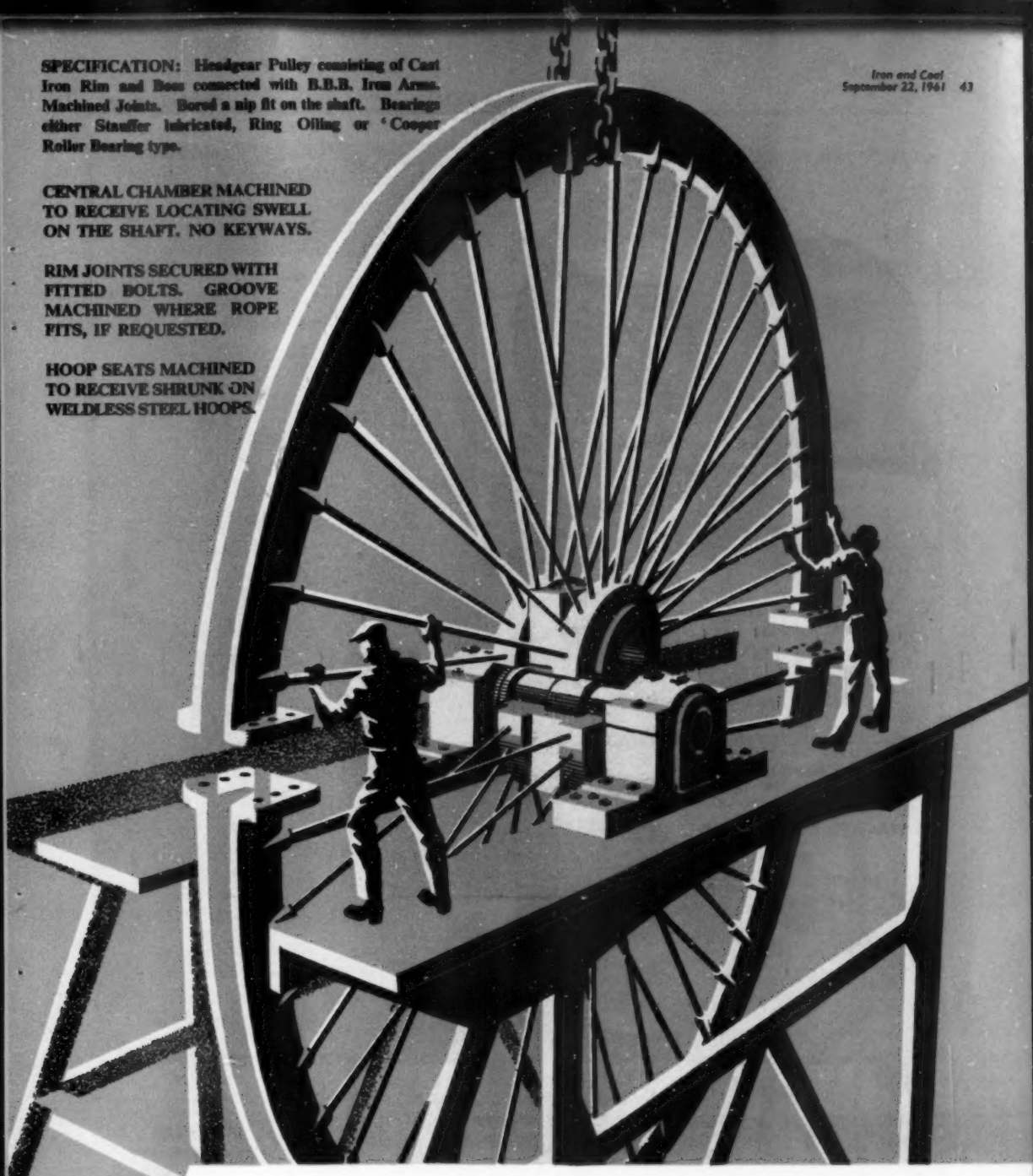

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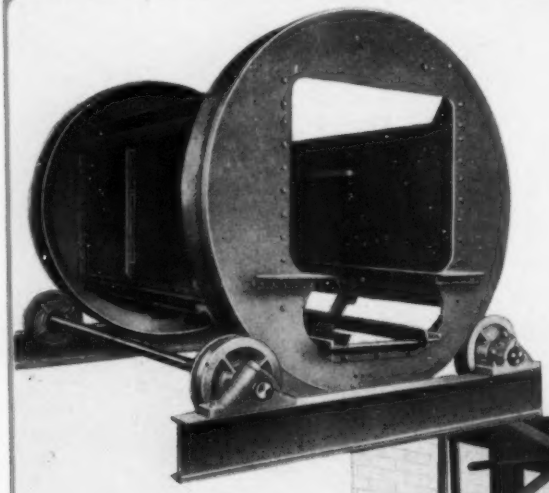

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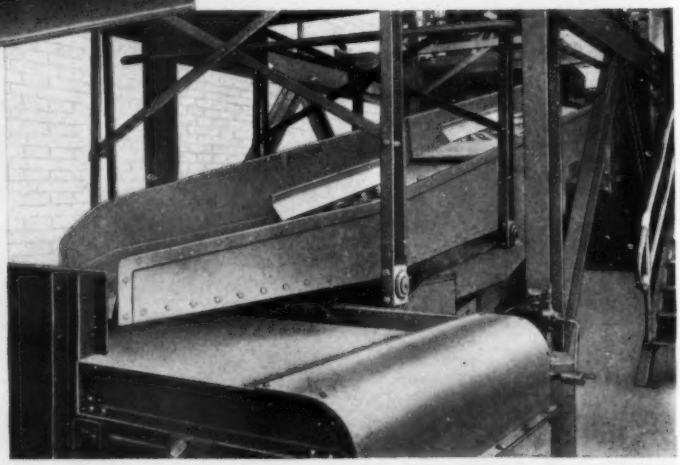

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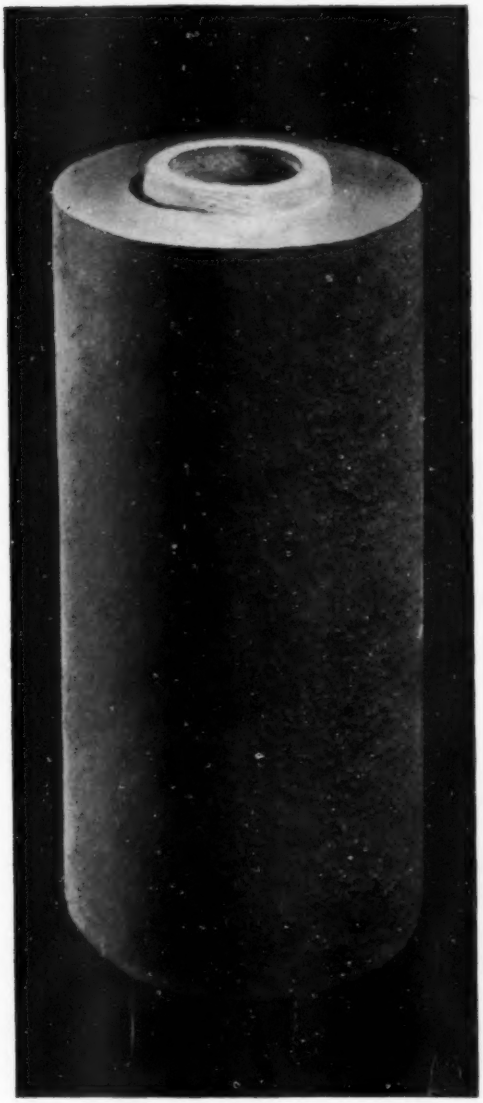

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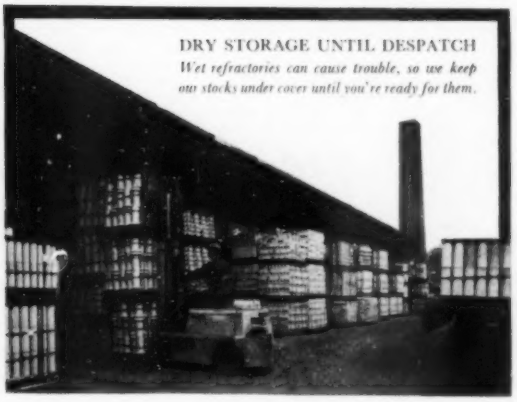
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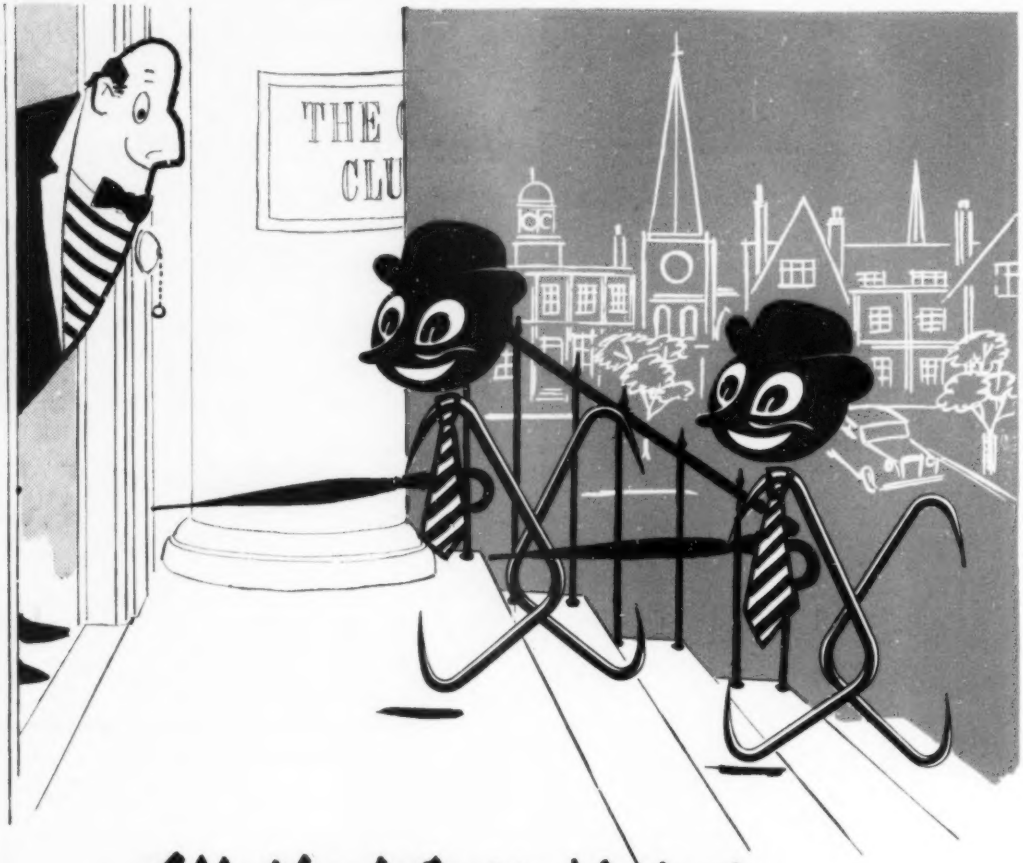

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No. 4862

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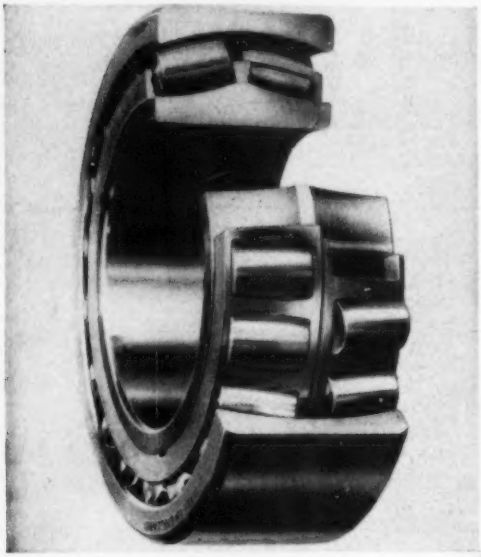

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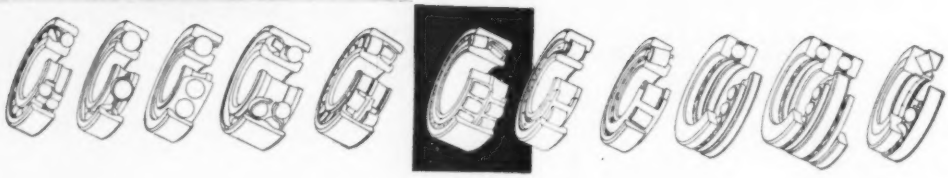

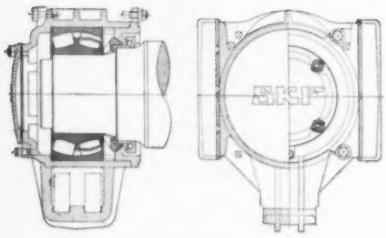

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IRON & COAL
THE IRON AND COAL TRADES REVIEW

Vol. 183 September 22, 1961 No. 4,862

Japanese Steel

THE Japanese economy began a new period of expansion in 1955, after a post-war decade devoted to restoration. The gross national production index for 1960 was 169.1 (1955=100) and the index of production of the mining and manufacturing industries 227.4. The steel industry has shown a spectacular growth (the production index last year was 235), and with it has gone a corresponding rise in steel exports. Output of ingot steel rose in five years from 9,400,000 metric tons to 22,140,000 tons for 1960, when exports (total iron and steel in terms of ingot steel) totalled 3,040,000 metric tons. The average annual increase of steel production over the five years has been 2,500,000 tons. Japan now ranks seventh on the list of world steel producers.

Hand in hand with the expansion of steel production has gone the adoption of modern techniques which could be expected. Blast furnaces of large capacity have been erected, and the coke ratio has been lowered substantially. According to "Japan's Iron and Steel Industry, 1961,"* the average consumption of coke per metric ton of pig-iron has been brought down to 600 kg., against the world's average of 800 kg. The use of oxygen in steelmaking has been extended, and automatic and continuous rolling systems have been adopted.

An old fear of the Japanese steel industry was of being handicapped by the lack of native ore and coal resources. This fear, it is now claimed, has proved groundless. Japan depends upon imports for 68 per cent. of her iron-ore needs, 51 per cent. of her coking coal, and 25 per cent. of her scrap. She has extended her gathering area for ore beyond the old sources of supply in the Philippines, Malaya, India, and Goa to Central and South America and Africa. The costs of transport over such long distances have been reduced by bringing large ore carriers into operation and by improving port facilities and erecting new discharging equipment. Japan has a long coastline and good natural ports and is siting her new steel plants along the Pacific coasts, to get the best advantage from imported raw-material supplies. Pig-iron is now admitted free of import duty.

The Japanese Government has formulated a "double income" plan, which aims at doubling the *per capita* income of the people between 1960 and 1970. The mining and manufacturing industries are scheduled to provide the main impetus to the planned income growth. If the plan comes to fruition, the domestic demand for steel is expected to reach 45,000,000 metric tons in 1970, an increase in consumption of steel per head of the population from the present 447 lb. to 970 lb. Adding to home demand 3,000,000 tons of net exports, a total output of 48,000,000 metric tons is forecast 10 years hence. This figure is well above the present output levels of all steel producers with the exception of Russia and America; to match it, British production would need to be doubled in the next decade.

Trade does not always follow the flag. World politics, opinion, preferences, and sentiment have their effect, but the bulk of the world's business is still done on the basis of willing buyer and willing seller, and the buyer places his orders where he can best get what he wants in the way of price, quality, delivery, and convenience. A break-down of Japanese iron and steel exports according to destination nevertheless brings its surprises. The main geographical groupings in 1960 were (in metric tons): Asia, 1,250,440; Europe, 25,351; North America, 675,587; South America, 165,754; Africa, 77,735; Oceania, 312,229. The surprises (to some) will be the extent of the Japanese iron and steel export trade with the United States, which last year totalled 582,505 tons, and with Australia, which took 276,531 tons. The United States was Japan's best customer for iron and steel last year, with India coming second and Australia third. US purchases were mainly of wire rods and wire products. Exports of 73,575 tons to the USSR (Asia) were almost exclusively cold-rolled sheets.

Japan acknowledges that she has raw material problems to face to assure achievement of her long-term development schedule, but is confident that they will be overcome. Her pre-war steel industry development was largely based on Chinese iron ore and coking coal, supplies of which are now lost to Japan. She is convinced that she can go on without depending on raw materials from China. More than 45,000,000 tons of iron ore will be needed in 10 years' time. At present, South-east Asia is the main source of supply and no difficulty is expected in maintaining supplies at around 7,000,000 to 8,000,000 tons; it is believed, indeed, that the tonnage can be doubled. Imports of 5,000,000 tons from India and Goa, it is thought, can be increased to 10,000,000 or even 18,000,000 tons. From North America the import of 3,000,000 tons can be assured without much difficulty. South America is looked to for 5,000,000 to 10,000,000 tons, and nearly the same quantity is expected from Australia and Africa. As for coking coal, annual import requirements a decade from now are put at 25,000,000

*Tokyo Foreign Service, Central P.O. Box 1157, Tokyo, Japan. 29p.

tons. Japan believes she can get this quantity from the United States, but she expects Australia to become a steadily growing supplier.

But although Japanese spokesmen of the iron and steel industry express their confidence in being able to get all the raw materials wanted, there is, undoubtedly, a keen desire to regain access to Chinese supplies. Large ore carriers and colliers can provide big economies, but freights nevertheless tend to rise as tonnages increase. At today's price levels, Japan believes she can compete with western rivals from the standpoint of pig-iron cost with ore of 62 per cent. Fe content at US $15 per metric ton, c.i.f. Her target level is US $14-15, which it is thought can be reached with the help of large carriers. For US coking coal it is regarded as necessary to keep the freight down to $7-8. At higher rates, unless world steel prices showed a corresponding rise, Japan might be in difficulties. It can be understood, therefore, that she would prefer to bring ore and coal across the short distance separating China from Japan. If China eventually becomes seated in the United Nations and her trade with the West is restored, the economy of the Japanese steel industry will be transformed, and Japan will become an even more formidable competitor in the steel markets of the world.

International Machine-tool Conference in Manchester

MACHINE-TOOL users, designers, and research workers from 14 countries will meet in Manchester on Monday for a five-day discussion of their problems. Nearly 400 delegates are expected to attend the conference, organized at the Manchester College of Technology by a committee chaired by Prof. F. Koenigsberger. Sir Stuart Mitchell, Controller of Guided Weapons and Electronics in the Ministry of Aviation, and chairman of the committee which recently reported on the machine-tool industry for the Board of Trade, will open the conference.

This is the second time a conference of this character has been held in Britain; the inaugural conference, last year, was held at Birmingham University, and it is intended to continue holding annual research and design conferences alternately in Manchester and Birmingham, the principal centres of the machine-tool industry in this country. Both the Manchester and Salford Colleges of Technology are doing machine-tool research, while the newly-formed Machine-tool Industry Research Association has established itself in Manchester.

Subjects to be discussed at next week's conference will include machine-tool design and performance, control systems, drives, and materials, and several of the group meetings will be devoted to particular machine-tool operations.

NEW OFFICES on the Durranhill Industrial Estate, Carlisle, are to be built for the Automatic Coal Cleaning Company, Limited.

Passing Thoughts . . .

LET us be especially diligent that the resources we look for in the name of development assistance are asked in support of programmes and projects which will, in fact, produce the results which all of us are seeking. But once we have this assurance . . . then let us be steadfast in our support, and generous in our appraisal of the need. For how else can we preserve hope in the future except by trying, and keeping on trying to make common cause with the peoples of the underdeveloped world, in helping them to rise from the depths of the poverty which for so long has been their lot.—MR. EUGENE R. BLACK, president of the International Bank for Reconstruction and Development, concluding his address to the board of governors in Vienna on Tuesday.

> *The advantages accruing from membership of the Common Market would in many respects be considerable, but in seeking them we cannot forget our own family obligations. And honesty apart, it is not good policy to discard old friends.—Nottingham Guardian Journal.*

It is disturbing to find that the volume of market research commissioned by manufacturers from Common Market countries for investigations into the British market is still far greater than that sponsored by British firms interested in Common Market sales.—Letter in the Financial Times.

> *The attitude held out to women scientists and technologists is, by and large, mediaeval in its origins. Britain is deliberately halving its capability by ignoring the potentialities of women in this field.*—DR. S. C. CURRAN, *principal of the Royal College of Science and Technology, Glasgow.*

The Common Market countries have already gone a considerable way towards the abolition of tariffs *inter se* and the creation of a uniform external tariff . . . it would create great difficulties for British manufacturers if they were expected to move a comparable distance at one jump.—The British Manufacturer, journal of the National Union of Manufacturers.

> *Evening classes are a form of sweated labour and, except for recreation or advanced refresher course studies, are as out of date as the steam locomotive.*—MR. H. A. WARREN, *principal of South-east London Technical College.*

Trades union leaders are continuously pressing for wage increases because of rising profits and dividends, entirely overlooking the fact that it is the preceding wage increase in the plant and equipment industries that has generated the new profit in sales receipts and that, in so far as real income is concerned, a general wage rise cannot bring to the worker a bigger share of the national cake. On the contrary the wage rise brings rising export prices, an unfavourable balance of trade, increasing unemployment, and a fall in living standards.—Letter in the Financial Times.

> *I don't eat sweets now—there's nothing so nice as a nice piece of coal. I'm trying to cure Susan of the habit. Somehow it doesn't seem natural.*—MRS. ISABELLA WALKER, *Dumfries, reported in the Daily Express.*

Tees-side lacks a sophisticated night life. This may be one of the reasons why industrialists from the south of England are reluctant to site new factories in the area.—ALD. A. NICHOLSON at a meeting of Stockton, Thornaby, and District Employment Committee.

Steel Stocks

FALL OF 2 PER CENT. IN SECOND QUARTER

STEEL stocks held by consumers and merchants fell by 80,000 tons, or nearly 2 per cent. in the second quarter of the year, states the Iron and Steel Board. This is in line with the board's estimate given last month. The fall was confined to stocks in consumers' hands with the level of merchants' stocks remaining virtually unchanged. Among the more important users of steel, the motor industry continued to reduce its stocks of sheet during the quarter, while shipbuilders and constructional engineers added to their stocks of plate.

Consumers' stocks at the end of June represented about 13½ weeks' usage based on consumption in the first half-year. This is close to what has been considered a normal holding in the past. However, there are indications that with most types of steel readily available, users may be preparing to operate with a rather smaller relative holding.

Total stocks held by consumers and merchants at the end of June were 4,511,000 tons, compared with 4,594,000 tons at the end of March. Consumers' stocks of sheet were 569,000 tons (664,000 tons in March), plate stocks were 782,000 (729,000) tons, and tinplate stocks 149,000 (162,000) tons. Stocks of other products were 2,499 (2,525) tons. Total stocks held by merchants at the end of June were 512,000 tons, compared with 514,000 tons at the end of March.

Alloy Steel Output

Although the production of steel in total is running at a lower rate this year than last, the output of alloy steel is continuing to rise, says the board. In the first seven months of 1961 the weekly average production of total steel was 457,900 tons, compared with 465,100 tons in the same period last year. Output of alloy steel, however, was at the weekly average of 32,500 tons against 31,000 tons last year, and that of stainless steel 4,850 tons against 4,810 tons.

For all items except strip the production of stainless steel has risen this year. The largest relative rise is shown by plate, which is in heavy demand for the manufacture of food processing and other chemical plant. Weekly average outputs of stainless and heat-resisting steel products in the first seven months of the year, with the figure for the corresponding period last year in parentheses, were:—Plate, 660 (510) tons; sections and steel bars, 650 (610) tons; bright steel bars, 90 (70) tons; hot rolled strip, 140 (140) tons; cold rolled strip, 230 (270) tons; sheet, 760 (740) tons.

RICHARD HILL TO CLOSE ROD MILL

ROD mill of Richard Hill, Limited, at Middlesbrough, is to be closed before the end of the year because of changes in the pattern of demand and the introduction in recent years of more modern integrated steelworks, the company announced on Tuesday.

A spokesman for the firm, which is part of the Firth-Cleveland, Limited, group, said that there would be very little redundancy of labour. The company will concentrate on expanding its other departments—wire mills, welded steel mesh, and reinforced concrete design service.

Orders Harder to Get, Says MI Chairman

WHILE orders in hand at Metal Industries, Limited, are at a high level, they are harder to get following the break up of price arrangements, said Sir Charles Westlake, chairman, at the annual meeting on Tuesday. Operating results for the first four months of the current year showed an improvement over the same period last year, but the coming months were not going to be easy, he warned.

SIR CHARLES WESTLAKE

In the electrical field competition was becoming increasingly intense, and all the group's endeavours were being directed to a reduction in costs to offset the steady erosion in profit margins. Together with the drive to improve production methods, the search was going on to make products even better to meet the challenge not only at home but from manufacturers in the Common Market countries.

Sir Charles said the Lancashire Dynamo & Crypto subsidiaries had recently introduced a new range of electric motors specially designed to meet differing national standards with substantially increased output from smaller frame sizes—the first of their kind to be offered by any British maker to world markets. The electronic instrument and hydraulic companies were also vigorously engaged on a series of projects which, they were convinced, would consolidate the leadership already established in these fields.

The unsettled state of the scrap industry was likely to continue for some time and this was bound to affect profits on the metal side of the business.

NEW RECORD iron-ore cargo for the UK arrived at Ore Quay, Tyne Dock, on Saturday in the Liberian ore carrier, Ore Prince. The vessel was carrying 37,276 tons of ore, loaded at Puerto Ordaz, Venezuela—nearly 2,000 tons more than the previous record cargo of 35,471 tons discharged at the same plant in July by her sister ship Ore Regent. The cargo is for the Consett Iron Company, Limited.

Threat to £2,000,000 Scottish Pit Modernization

WORK on a £2,000,000 development scheme at Valleyfield Colliery, Fife, will be stopped unless output is stepped up, the pit's 800 miners have been warned by Mr. William Rowell, Area general manager. In January last year, Mr. Rowell told the colliery consultative committee that the Scottish Divisional Coal Board was to spend £2,000,000 on equipping No. 2 shaft and developing to a depth of 370 fathoms. To justify expenditure, however, overall production of at least 24 cwt. per manshift would be called for. The rate at the time was 19 cwt. per shift.

Mr. Rowell, in his warning to the men, said that production had increased since that time to 22 and 23 cwt. per manshift, but since April of this year had fallen back, and output and productivity were at a level which did not justify the continuance of expenditure on reconstruction and mechanization. Although a certain amount of output had been lost through breakdowns and deterioration in geological conditions, he was personally confident that the colliery could still be made into a first-class pit, provided full co-operation was given by management and men.

Referring to the declining coal reserves in other parts of the coalfield and the inevitability of further closures, Mr. Rowell stressed the importance of success at Valleyfield. Reconstruction at the colliery would be costly, but without it the pit's future life would be seriously curtailed due to the limitation of existing underground transport and ventilation facilities.

Union leaders are to hold a further meeting with the men with a view to obtaining co-operation and raising productivity to the required level.

Higher Subscriptions for Pit Overmen?

BECAUSE of a general decline in numbers in the industry, colliery overmen and deputies employed at pits throughout Yorkshire were warned on Saturday that they might have to pay increased union subscriptions in order to keep themselves up-to-date with progress in the mining industry.

The warning came from Mr. Laurie Wormald, national president, and Yorkshire Area secretary of the National Association of Colliery Overmen, Deputies, and Shotfirers, speaking at Barnsley. The decline, he said, was automatically reflected in the membership and finances of the Association.

"My personal view," he went on, "is that we should not cut our cloth to meet this shortage, but readjust our contributions so as to maintain and improve on the services the union is already giving to members. This is the only way we can expect to keep up with the rapid growth of knowledge which will be required by the trade unions to meet the new techniques and problems which will originate from our industry during the next few years."

The Yorkshire association, with 8,000 members the largest in the country, decided not to support a resolution which is being placed before the autumn conference at Scarborough on September 25 by the Scottish association, calling for immediate negotiations for the uniformity of wages for all under-officials.

Sir Henry Jones Looks Back

SPEAKING to the centenary annual meeting of the Scottish Association of Gas Managers in Edinburgh on Thursday of last week, Sir Henry Jones, chairman of the Gas Council recalled his presidential address to the Institution of Gas Engineers in May, 1957. He said then that if present trends of coal production continued, large and graded coals would become scarcer and small coals, usually of low rank, would become relatively more plentiful so that within the next 10 to 20 years small coal might become more difficult to sell and be available for gas manufacture at a price enabling gas to compete with other sources of energy.

Sir Henry also foresaw that oil would be available in increasing amounts and that gas made from the products of oil refineries, gaseous or liquid, might be as cheap or cheaper than gas made from coal. He also believed in 1957 that if full advantage was to be taken of modern chemical engineering techniques, processes were needed which could be built into large-scale units. Only in this way could high capital costs be balanced by even higher proportionate outputs.

Looking back he would not want to alter what he said, said Sir Henry, but to add that if the Gas Council's methane scheme was authorized prospects would be even better. Coal, oil, and methane would all form part of the industry's prosperity provided the cost enabled them to make gas at a price suitable to their customers.

REDUCING COLLIERY SPOIL HEAPS IN YORKSHIRE

PLANS to reduce the size and number of colliery spoil heaps to improve the Yorkshire countryside are being discussed by the North Eastern Divisional Coal Board and West Riding County Council. This follows a letter which has been sent by the Ministry of Housing and Local Government to all local authorities saying that the Coal Board is prepared to consider small, inexpensive schemes for the improvement of spoil heaps.

Already in Yorkshire the board is reducing the tips at Barnsley Main and Monk Bretton collieries by returning waste material underground. There are also plans for the Wharncliffe Woodmoor Colliery (4 and 5 units) stack to be reshaped and grassed. The county council has carried out renovation schemes at Mitchell Main, Wombwell, Grimethorpe, and Worsbrough collieries.

Mine Rescue Station Praised

CHAIRMAN of the North Staffordshire Area Mines Rescue Committee, Mr. L. W. Fletcher, told National Coal Board officials and rescue workers last Friday at the Area rescue competition that when the new Area rescue station at Berry Hill Colliery, near Stoke-on-Trent, is completed shortly, local miners should have training facilities "second to none in the country."

It was the first time that the competition had been held at Berry Hill. The winners, Parkhall Colliery team, will represent the Area in the divisional competition at Birmingham on October 28.

ANTHRACITE SUPPLY

Further Investments at Cynheidre

DECISION whether to invest a further £5,000,000 to £6,000,000 on development at the new anthracite pit at Cynheidre, near Llanelly, is to be made by the National Coal Board, in the near future. Lord Robens, chairman of the board, made this announcement on Tuesday after spending two hours underground at the colliery. The board had already spent £10,000,000 on the pit, he said. It was now faced with the further expenditure to provide access to reserves of anthracite to be mined in five or six years' time.

"We shall have to decide whether it is going to be an economic proposition to invest a further large sum in going for other reserves which are not available at the moment," he said. "We have a big marketing problem inasmuch as anthracite is scarce. I want to see the total production of anthracite grow because I would like to put a very big selling campaign behind it.

"I am pretty certain that if we did we could compete very easily with oil in London and the southern counties where competition is greatest at the present time," Lord Robens declared.

Must be Reasonably Priced

The future of anthracite lay in the industry's capacity to produce it at reasonable prices. The sole object in developing new pits like Cynheidre was to provide access to reserves which would enable mechanization to go ahead with production quickly, increase output, and permit the sale of ample supplies of good quality fuel at competitive prices. To assess the possibility of such a programme had been the purpose of his visit to the colliery. He wanted to see whether the capital outlay already made and the improved results he was sure would follow, would justify the investment of another £5,000,000 or £6,000,000.

The coal at Cynheidre was good, the seams were good and it was now a question of getting the manpower and management to work as a team to develop the output.

Lord Robens was welcomed at the colliery by Mr. Donald Davies, Area general manager, Mr. J. G. Tait, divisional industrial relations director, Mr. J. D. H. Davies, Area production manager, Mr. H. G. Evans, group manager, Mr. C. Bryant, manager of Cynheidre, Mr. J. H. Pedley, mining engineer in charge, and Mr. R. Barfoot, chief planning engineer. He was accompanied by Mr. A. H. Kellett, chairman of the South-Western Divisional Coal Board, Mr. W. V. Sheppard, director-general of production, NCB, and Mr. G. S. Morgan, divisional production director.

It was also announced this week that a scheme costing £4,000,000 to produce more anthracite from the Vale of Neath, a further step in the plans of the South-Western Divisional Coal Board for working anthracite reserves in the South Wales coalfield more efficiently and economically, is well advanced.

Coal-getting from one of three new projects—Blaengwrach Colliery, which is being driven horizontally more than two miles into the hillside—is expected to start next June. Blaengwrach will replace the nearby Cwmgwrach Colliery which has been worked for the past 80 years.

Two other drift mines in the valley—Rock and Aberpergwm—are also due for closure soon under the scheme, which includes Pentreclwyda Colliery, opened about three years ago and now being further developed, and a new coal preparation plant at Cwmgwrach, now nearing completion. Coal reserves at Blaengwrach are estimated at 11,000,000 tons. So far, 2,500 yds. of the mine's eventual 3,900 yds. have been driven. A British tunnelling record of 108 yds. in seven days was set up there last February.

A spokesman for the divisional board said that the Vale of Neath plan would ensure continued employment for those men from collieries which would be closed. Modern production methods and transport facilities would mean higher output with more men employed in actual coal-getting and a reduction in the number employed on other pit duties. At present there were five or six men for every one producing coal at Cwmgwrach Colliery. At Blaengwrach it would be two to one.

OMS Target Passed at Lea Hall Colliery

OUTPUT per manshift at Lea Hall Colliery, Rugeley (Staffs), which was opened 14 months ago, has exceeded the original target planned for it on completion of development in 1964-65. The West Midlands Divisional Coal Board states that in the week ended September 9, overall productivity rose to 47.9 cwt., an increase of 6 cwt. on the previous highest figure. The original estimate on completion of the colliery was 43.5 cwt. In the same week, face workers produced 185.3 cwt. per manshift, and saleable output totalled 8,274 tons.

Production at Lea Hall is completely mechanized, and a new face has recently gone into production. It is expected that the year's target of just over 200,000 tons will be well exceeded. The pit's performance helped to increase OMS in the Cannock Chase Area to 33.6 cwt., the highest weekly figure achieved by any Area in the West Midlands Division. Coal face productivity reached 103.6 cwt., another record for Cannock Chase.

THE 500 men in the boilermaking trades involved in the week-old strike at the Walker-on-Tyne shipyard of Vickers-Armstrongs (Shipbuilders), Limited, were expected to return to work yesterday (Thursday). Informal talks between the management and the Boilermakers' Society had produced a basis of agreement for the rate of pay for a new automatic flame cutting machine recently introduced at the yard.

Personal

Chairman of BEAMA Export Panel

DIRECTOR of oversea operation with the English Electric Company, Limited, Mr. LEONARD H. SHORT has been elected chairman of the export panel of the British Electrical and Allied Manufacturers' Association. The panel, which comprises leading specialists in the electrical industry on export matters, is the chief advisory body to the BEAMA Council on oversea trade.

Mr. Short has been vice-chairman of the panel for the past two years and succeeds Mr. E. V. Small, consultant to Associated Electrical Industries Export, Limited, who has been chairman for this period. The new vice-chairman is Mr. HAROLD P. MARTIN, sales director of C. A. Parsons & Company, Limited.

Brig. C. A. LANGLEY, of the Ministry of Transport, has accepted the invitation to be president of the Junior Institution of Engineers for 1961-62.

Rotherham College of Technology is to be opened on November 2 by the DUKE OF EDINBURGH, who on the same day will visit new buildings at Sheffield University and attend a luncheon there.

Following his appointment as High Commissioner for the UK in Canada, LORD AMORY has resigned from the board of Imperial Chemical Industries, Limited. He has also resigned as a director of the Steel Company of Wales, Limited.

Mayor of Wallsend, Cllr. J. H. BRANCH, who is Wallsend branch secretary of the National Union of Mineworkers, last week made an official visit to the oil seal division plant at Wallsend of George Angus & Company, Limited.

Mr. W. H. SHARP, managing director of Thomas Smith & Sons (Rodley), Limited, crane and excavator makers, of Leeds, leaves Britain on September 30 on a prolonged tour of Smith distributors in South Africa, Australia, New Zealand, Singapore, Malaya, and India. He hopes to be back in Britain early in December.

Former general secretary of the National Union of Mineworkers, Mr. ARTHUR HORNER is to take part in a radio portrait of the late Mr. Aneurin Bevan called "The Member for Ebbw Vale" in the Home Service of the BBC on October 3. He will speak about Mr. Bevan's attitude to the leaders of the Trades Union Congress.

Managing director of Lang Pneumatic, Limited, air equipment manufacturers, of Birmingham, Col. R. W. W. TAYLOR has been appointed vice-chairman of the European Technical Pneumatic Controls Commission, which was set up in June to ensure central handling of economic problems connected with oil hydraulics and pneumatics.

Commercial director of Vickers-Armstrongs (Shipbuilders), Limited, Walker-on-Tyne, Mr. F. D. STICKLAND is to retire in March after 50 years with the Vickers group. He joined Vickers-Armstrongs in 1911 at Barrow engine works and in 1925 was appointed secretary and manager of the Dublin Dockyard Company, Limited. In 1939 he became secretary and commercial director of Palmers Works, Hebburn, remaining in that position until 1955, when he was appointed commercial director of all Vickers-Armstrongs' shipbuilding operations, with headquarters at Walker-on-Tyne. He will be succeeded by Mr. W. A. TILL, commercial director of Vickers-Armstrongs (Engineers), Limited, Barrow.

Plaque to Commemorate Charles Manby

AT the suggestion of the Newcomen Society, which exists to promote the study of the history of engineering and technology, the London County Council is to erect a plaque at 60, Westbourne Terrace, Paddington, to commemorate Charles Manby, civil engineer, who lived there from 1870 to 1876.

In 1821, with his father, Charles Manby, who was then 17, laid down the Aaron Manby, the first iron steamship to make a sea voyage. The hull was built at Horseley Ironworks which had been established by his father. At 19 Manby undertook the construction of gasworks in France and, subsequently, constructed a number of marine engines for the French Government.

In 1829 he returned to England and became manager successively of the Beaufort Ironworks and the Ebbw Vale Iron Company, where he introduced several modifications in the rolling of rails. Six years later he moved to London and devoted himself to the introduction of a system of warming and ventilating buildings, known as Price and Manby's system.

He was actively engaged in the staging of the Great Exhibition of 1851 and later was a member of the International Scientific Commission held to consider the construction of the Suez Canal. When he died at the age of 80 he had served for nearly half a century as secretary (acting or honorary) of the Institution of Civil Engineers and its high standing and prosperity were largely his achievement.

Awards of Junior Institution of Engineers

COUNCIL of the Junior Institution of Engineers has made the following awards in respect of papers and lectures delivered during 1960-61: Institution gold medal, R. F. W. Guard, for his paper "Nuclear Fuels"; Institution silver medal, E. R. Brazier, for his paper "Engineering in Chemical Works"; Vickers prize and medal, John Heywood, for his paper "Radio Investigation of the Solar Atmosphere."

The Tookey award has been made to Leonard Clegg, for his paper "Boiler Management in Small Plants," and the Dunn medal has been won by John M. Tebby, for his lecturette "Formed Ends for Chemical Plant and the Like." For his thesis "A Consideration of the Free-piston Gas-Generator Turbine as a Prime Mover for Automobiles," G. S. Taylor won the Durham bursary.

DURGAPUR STEEL EXPANSION

ENGINEERING consultants, W. S. Atkins & Partners, London, S.W.1, has been invited to examine the project on the expansion of the Durgapur steelworks by 600,000 tons. On the basis of the report the Indian Government will invite tenders.

Negotiations have started at Ranchi between Hindustan Steel and the Russians to complete an agreement on the basis of the Russian project report for the expansion of the Bhilai steelworks by 1,000,000 tons.

Canada's Iron Ore

OPPORTUNITIES FOR MANUFACTURERS

REGRET that UK manufacturers have obtained only a meagre share of the large market for capital equipment, stores, etc., which has sprung up through the exploitation of iron-ore deposits in the Quebec/Labrador area of Canada, is expressed by Mr. Arnold Heckle, UK Principal Trade Commissioner in Montreal, writing in the Board of Trade Journal. The development of the iron-ore resources of the area has, he states, been one of the most spectacular features in the recent history of Canadian industry.

No iron ore was mined in the area prior to 1954, although substantial deposits were known to exist in what is known as the "Labrador Trough." In 1954 about 500,000 tons were shipped and by 1959 the figure had risen to 13,000,000 tons (roughly twice the tonnage of Ontario), making Quebec/Labrador the largest producing area in the Dominion.

The development continues and three new and very large projects are likely to be in production in the next few years, with more to follow, which could well double the present output. The programme, less than 10 years old, has meant the investment of over $1,000,000,000 and the purchase of vast stores, not only for the development of the mining projects but for the building of railways, towns, docks and harbours, etc.

Growth of Mining

Stressing the importance of mining in the Canadian economy, Mr. Heckle points out that with the exception of extensions to the Pacific Great Eastern Railway in British Columbia virtually every mile of new railroad constructed in the Dominion since the end of the last war has been the direct result of mineral development.

It was not until 1886 that Canada developed what might be called an iron-ore industry. Between that year and 1924 approximately 6,500,000 tons of ore were shipped but, from 1924 to 1938, no iron ore was mined in Canada and it was not until 1939 that production was resumed. (Many millions of tons of iron ore were shipped from the Wabana Mine in Newfoundland during this period but Newfoundland did not enter Confederation until 1949.) In 1959 Canada shipped 22,000,000 tons of iron ore and it is estimated that by 1966 the figure will reach more than 40,000,000 tons.

Canada's iron-ore industry now holds fifth position in domestic mineral production; among world exporters of iron ore it now takes second place, but, as a result of the development of new projects, may soon rank first. Although production in the Province of Ontario has increased, the Quebec/Labrador area is now the major source of iron ore production. This enormously increased production will, in the main, find its way to steel mills in the US who have made large investments in the new iron-ore producing projects. In addition, Canada will find markets in the UK, the continent of Europe and Japan, apart from supplying its own expanding iron and steel industry.

In addition to the Schefferville operation of the Iron Ore Company of Canada, Limited, which produced by the end of 1960 over 66,000,000 tons of ore with iron content averaging 53 per cent., three major developments are timed to come into operation within the next four years. They are the Lac Jeannine, Carol Lake, and Wabash Lake schemes.

Suggesting how UK manufacturers might get into this expanding market, Mr. Heckle stresses that there are opportunities for UK companies over a wide field of products—one purchasing officer had said that his company bought everything except churches!

There were opportunities for selling throughout the whole range of capital and consumer goods, including hospital and scientific equipment. Inquiries revealed that UK suppliers had so far failed to achieve any worthwhile success in this market and there was no sustained effort to increase the UK share.

Mr. Heckle puts visits as of primary importance in selling to the mines—"quite the most important part of selling is to convince the mine managers of the suitability and quality of equipment . . . the mine manager is the person who ultimately must be satisfied."

The isolated location of the mines emphasized the need for spares and service to be available at convenient points; otherwise mine managers and purchasing officers would not risk a purchase. Too much was at stake to tolerate the prolonged idleness of any piece of machinery and the trend was to the standardization of equipment to simplify the problem of spares.

Clearly, machinery and equipment could not be sold from a catalogue and UK firms who felt they had suitable products to offer and who were not already represented in Canada should take steps to appoint agents. The prelude to success must be full investigation of requirements and, although the management of mining companies was friendly and helpful, it could not be too strongly stated that it would have to be convinced not only that UK suppliers could produce the right goods at the right price, but that their interest would be maintained and the continuity of supplies and spares assured.

Uganda's New Steel Mill

WITH the foundations completed, structural work is expected to begin shortly on the steel rolling mill project at Jinja, reports Barclays Bank D.C.O. from Uganda. It is expected that the buildings will be finished by the end of November, when the installation of machinery will begin.

A railway line has already been laid to the site and it is planned to have the factory in production by July, 1962—12 months after work started on the foundations.

Appointments

Engineering Posts in AEI Turbine Division

NEW engineering appointments in the turbo-generator division of Associated Electrical Industries, Limited, are announced. Mr. J. S. HALL, chief engineer, large steam turbine department, since 1959, becomes divisional assistant chief mechanical engineer, and Mr. J. V. BIGGS, chief engineer, general engineering department, becomes in addition divisional assistant chief mechanical engineer (auxiliary apparatus). Mr. D. M. SMITH, chief engineer, mechanical engineering development, since 1956, is appointed consulting mechanical engineer, and Mr. D. F. SHANNON, chief engineer, gear engineering department, becomes chief engineer, mechanical experimental development and gearing.

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Coal Export Drive at British Fair in Sweden

IN a drive to increase exports the National Coal Board will have the largest single exhibit at the all-British Trade Fair at Stockholm, from May 18 to June 3, 1962. A huge hollow pyramid of coal, coke, and by-products outside the main exhibition hall is planned as the central feature of a 9,000 sq. ft. exhibit, and it is planned that inside the pyramid Swedish visitors will see miners working at a coal face with the latest British equipment. A giant symbolic figure of the British miner will stand outside the pyramid.

This is the first time the NCB has exhibited at an oversea trade fair. Prof. Misha Black, professor of industrial design (engineering) at the Royal College of Art has been invited to design the exhibit.

The private sector of the British coal and coke industry, including the British Coal Exporters' Federation and the British Coking Industry Association, will co-operate with the NCB in the export drive. Last year exports to Sweden of coal, coke and briquettes increased by almost £1,000,000, compared with 1959. In 1959 Britain exported to Sweden 442,929 tons of coal, coke, and briquettes valued at £2,382,665. In 1960 she exported 618,614 tons valued at £3,118,044.

Midland Miners' Union Dues Increased

TO meet rising costs and in common with some other Areas, the Midland Area Council of the National Union of Mineworkers has decided to increase members' contributions. At its meeting at Stafford on Monday the council agreed on a 6d. a week increase for full members and 3d. a week for those under 18. Despite the increase the new contributions rate is believed still to be one of the cheapest in the country.

Reporting on the day release courses for the rank and file in the industry, Mr. J. H. Southall, Area secretary, said that 20 students would be catered for at Cartwright House, Hanley (Staffs), and 24 at Birmingham University. The cost—about £4,000 a year for wages, travelling, and subsistence—was being met by the National Coal Board and the union.

Shaft Sinkers Strike at Welsh Collieries

A FEW HOURS before Lord Robens, chairman of the National Coal Board, arrived to inspect the NCB's new anthracite pits at Cynheidre, near Llanelly, and Abernant, Swansea Valley, on Tuesday, more than 340 men engaged on shaft-sinking and tunnelling and employed by the Thyssen Shaft-Sinking Company, Limited, went on strike. So far production work at the collieries has not been affected.

The dispute, which is outside the jurisdiction of the National Union of Mineworkers, concerns the transfer of a German employee at Cynheidre to a mining project undertaken by the parent company Schachtbau-Thyssen, in Germany.

A £50,000 EXTENSION to the headquarters of the Institution of Mechanical Engineers, Birdcage Walk, London, S.W.1, will be shown to members on Wednesday when the institution's first "open day" will be held.

Obituary

SIR ELLIS HUNTER

Distinguished Steel Industry Personality

WE regret to announce the death of Sir Ellis Hunter, chairman of Dorman, Long & Company, Limited, and its principal subsidiaries, and president of the British Iron and Steel Federation from 1945 to 1953. Sir Ellis died yesterday (Thursday). Born on February 18, 1892, he had been a leading figure in the iron and steel industry for many years. He played a major part in formulating the industry's Plan of Development, which was submitted in 1945 and later approved by the Government and published as a White Paper. He was knighted in 1948 and was made KBE this year.

Sir Ellis, who had been chairman since 1948 and was also managing director of Dorman, Long & Company, retired at the end of March from all executive appointments in the group, including the joint managing directorship of Dorman Long (Steel), Limited. It was then announced that he would continue as chairman of the parent company and its principal subsidiaries.

SIR ELLIS HUNTER

He had been a member of the board of Dorman, Long & Company since 1938, when he was also appointed deputy chairman of the company. In 1945, the year in which he was elected president of the British Iron and Steel Federation, Sir Ellis became the first chairman of the British Steel Producers' Conference.

Sir Ellis, who was educated privately, qualified as a chartered accountant in 1913, and during the first world war he worked with the Ministry of Munitions on iron and steel works extensions. During his association with Dorman, Long & Company he was responsible for its exceptional developments, especially since the last war.

MR. F. P. MILLS

FORMER chief of the Northern Counties Colliery Rescue Brigades, Mr. Frederick Peter Mills has died at the age of 73. An authority on colliery rescue work, he was the author of several technical books and contributed a number of articles to IRON AND COAL. Mr. Mills was chief of the Brigades from 1913 until he retired in 1954 and was responsible for air raid precautions in collieries during the last war. He trained rescue teams for coalfields all over Britain and was responsible for a number of improvements being effected in mines rescue equipment.

A past president of the North of England Institute of Mining and Mechanical Engineers and also of the North of England branch of the National Association of Colliery Managers (1935-36), he had been a keen member of the NACM for many years. He was made OBE in 1941.

The death has taken place at South Shields of Mr. DUNCAN MCLEAN, who was shiprepairing manager with John Readhead & Sons, Limited, South Shields, until his retirement in 1959, after 44 years with the company. He was 62.

The death has occurred of Mr. CHARLES VAUGHAN HILL, former joint managing director of Charles Hill & Company, Limited, brassfounders and diecasters, etc., and of Hills Precision Die Castings, Limited, both of Birmingham. Mr. Hill, who was 59, retired from business about three years ago.

The death has occurred of Mr. ROBERT HARKESS, who was general secretary of the Scottish Brass Turners, Fitters, Finishers, and Instrument Makers' Association for almost 25 years. He was 71. Mr. Harkess was also a former chairman of the Clyde district committee of the Confederation of Shipbuilding and Engineering Trades Unions.

On a Bicycle Made for Two

REFERENCE was made in last week's issue of IRON AND COAL to an underground bicycle which is used by Mr. Thomas Crelling, manager of West Cannock No. 5 Colliery, West Midlands Division of the National Coal Board, in his underground tours of inspection.

An agency report implied that Mr. Crellin had invented the machine. We are informed, however, that Mr. Crellin's machine was provided by Underground Mining Machinery, Limited, Aycliffe, near Darlington (Co. Durham), as the sole licensees of the German firm of Scharf who developed and manufactured the cycle.

TILLEY LAMP COMPANY, LIMITED—Mr. A. J. Vening has resigned from the board because of ill-health.

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Starting work in 1925 as an apprentice with Rolls-Royce, Limited, Mr. N. PRIESTLEY is to take charge of factory operations at Motores Rolls-Royce, SA, in Brazil, and is expected to leave later this month. He became personal technical assistant to the general manager in 1937 and after service at other Rolls-Royce factories he was made deputy chief inspector at Derby in 1949. In 1955 he became chief inspector and three years later was made chief quality engineer, Derby group.

AS PART OF the national drive to meet the shortage of trained executives, the Polytechnic, London, is to organize a course for a diploma in management studies, beginning in October. Subjects in the course will include production, costing, quality control, maintenance, work measurement, industrial relationships and ergonomics, and general management matters.

Coal Export Drive at British Fair in Sweden

IN a drive to increase exports the National Coal Board will have the largest single exhibit at the all-British Trade Fair at Stockholm, from May 18 to June 3, 1962. A huge hollow pyramid of coal, coke, and by-products outside the main exhibition hall is planned as the central feature of a 9,000 sq. ft. exhibit, and it is planned that inside the pyramid Swedish visitors will see miners working at a coal face with the latest British equipment. A giant symbolic figure of the British miner will stand outside the pyramid.

This is the first time the NCB has exhibited at an oversea trade fair. Prof. Misha Black, professor of industrial design (engineering) at the Royal College of Art has been invited to design the exhibit.

The private sector of the British coal and coke industry, including the British Coal Exporters' Federation and the British Coking Industry Association, will co-operate with the NCB in the export drive. Last year exports to Sweden of coal, coke and briquettes increased by almost £1,000,000, compared with 1959. In 1959 Britain exported to Sweden 442,929 tons of coal, coke, and briquettes valued at £2,382,665. In 1960 she exported 618,614 tons valued at £3,118,044.

Midland Miners' Union Dues Increased

TO meet rising costs and in common with some other Areas, the Midland Area Council of the National Union of Mineworkers has decided to increase members' contributions. At its meeting at Stafford on Monday the council agreed on a 6d. a week increase for full members and 3d. a week for those under 18. Despite the increase the new contributions rate is believed still to be one of the cheapest in the country.

Reporting on the day release courses for the rank and file in the industry, Mr. J. H. Southall, Area secretary, said that 20 students would be catered for at Cartwright House, Hanley (Staffs), and 24 at Birmingham University. The cost—about £4,000 a year for wages, travelling, and subsistence—was being met by the National Coal Board and the union.

Shaft Sinkers Strike at Welsh Collieries

A FEW HOURS before Lord Robens, chairman of the National Coal Board, arrived to inspect the NCB's new anthracite pits at Cynheidre, near Llanelly, and Abernant, Swansea Valley, on Tuesday, more than 340 men engaged on shaft-sinking and tunnelling and employed by the Thyssen Shaft-Sinking Company, Limited, went on strike. So far production work at the collieries has not been affected.

The dispute, which is outside the jurisdiction of the National Union of Mineworkers, concerns the transfer of a German employee at Cynheidre to a mining project undertaken by the parent company Schachtbau-Thyssen, in Germany.

A £50,000 EXTENSION to the headquarters of the Institution of Mechanical Engineers, Birdcage Walk, London, S.W.1, will be shown to members on Wednesday when the institution's first "open day" will be held.

Obituary

SIR ELLIS HUNTER

Distinguished Steel Industry Personality

WE regret to announce the death of Sir Ellis Hunter, chairman of Dorman, Long & Company, Limited, and its principal subsidiaries, and president of the British Iron and Steel Federation from 1945 to 1953. Sir Ellis died yesterday (Thursday). Born on February 18, 1892, he had been a leading figure in the iron and steel industry for many years. He played a major part in formulating the industry's Plan of Development, which was submitted in 1945 and later approved by the Government and published as a White Paper. He was knighted in 1948 and was made KBE this year.

Sir Ellis, who had been chairman since 1948 and was also managing director of Dorman, Long & Company, retired at the end of March from all executive appointments in the group, including the joint managing directorship of Dorman Long (Steel), Limited. It was then announced that he would continue as chairman of the parent company and its principal subsidiaries.

SIR ELLIS HUNTER

He had been a member of the board of Dorman, Long & Company since 1938, when he was also appointed deputy chairman of the company. In 1945, the year in which he was elected president of the British Iron and Steel Federation, Sir Ellis became the first chairman of the British Steel Producers' Conference.

Sir Ellis, who was educated privately, qualified as a chartered accountant in 1913, and during the first world war he worked with the Ministry of Munitions on iron and steel works extensions. During his association with Dorman, Long & Company he was responsible for its exceptional developments, especially since the last war.

MR. F. P. MILLS

FORMER chief of the Northern Counties Colliery Rescue Brigades, Mr. Frederick Peter Mills has died at the age of 73. An authority on colliery rescue work, he was the author of several technical books and contributed a number of articles to IRON AND COAL. Mr. Mills was chief of the Brigades from 1913 until he retired in 1954 and was responsible for air raid precautions in collieries during the last war. He trained rescue teams for coalfields all over Britain and was responsible for a number of improvements being effected in mines rescue equipment.

A past president of the North of England Institute of Mining and Mechanical Engineers and also of the North of England branch of the National Association of Colliery Managers (1935-36), he had been a keen member of the NACM for many years. He was made OBE in 1941.

The death has taken place at South Shields of Mr. DUNCAN MCLEAN, who was shiprepairing manager with John Readhead & Sons, Limited, South Shields, until his retirement in 1959, after 44 years with the company. He was 62.

The death has occurred of Mr. CHARLES VAUGHAN HILL, former joint managing director of Charles Hill & Company, Limited, brassfounders and diecasters, etc., and of Hills Precision Die Castings, Limited, both of Birmingham. Mr. Hill, who was 59, retired from business about three years ago.

The death has occurred of Mr. ROBERT HARKESS, who was general secretary of the Scottish Brass Turners, Fitters, Finishers, and Instrument Makers' Association for almost 25 years. He was 71. Mr. Harkess was also a former chairman of the Clyde district committee of the Confederation of Shipbuilding and Engineering Trades Unions.

On a Bicycle Made for Two

REFERENCE was made in last week's issue of IRON AND COAL to an underground bicycle which is used by Mr. Thomas Crelling, manager of West Cannock No. 5 Colliery, West Midlands Division of the National Coal Board, in his underground tours of inspection.

An agency report implied that Mr. Crellin had invented the machine. We are informed, however, that Mr. Crellin's machine was provided by Underground Mining Machinery, Limited, Aycliffe, near Darlington (Co. Durham), as the sole licensees of the German firm of Scharf who developed and manufactured the cycle.

TILLEY LAMP COMPANY, LIMITED—Mr. A. J. Vening has resigned from the board because of ill-health.

Solving Water Supply Problems

EXCEPT in times of drought, a sufficient supply of wholesome water is taken for granted by the vast majority of the general public. Industry, however, has for many years been acutely conscious of the need for a reliable supply of water.

DR. R. G. ALLEN

In such undertakings as the new Spencer Steelworks of Richard Thomas & Baldwins, Limited, at Llanwern (Mon), for example, it was a major consideration not only in the initial planning of the works, but in the choice of site. The rapid growth of industrial Britain has imposed a great strain on its available water supplies; in fact, so much water is needed that the water industry must now turn to sources of ever-increasing impurity. This has called for scientific studies of purification processes which the mechanical and civil engineering background of the industry could not provide alone and it was therefore that in 1953, the water industry, foreseeing this as a developing problem, combined to set up and finance the Water Research Association.

In 1955, the present director, Dr. R. G. Allen, in makeshift premises at Redhill (Surrey), began, with a small staff, to tackle the more urgent problems and it soon became apparent that the association had a great contribution to make. Today the WRA is supported by the major part of the industry it serves, is included in the Government grant-aided scheme of industrial research associations, and is housed in specially designed buildings at the new research station at Medmenham, near Marlow (Bucks). It was to Medmenham that the Press was invited on Tuesday to see something of the work that is being done by the association, the sort of problems that are being tackled, and to learn a little of the lines upon which future research is planned.

A large part of the water used by industry is provided not by water undertakings but by the firms themselves. They are already beginning to show a great interest in the work of the WRA and, as their needs increase, must look increasingly to the association in the future.

On Tuesday the principal work of the five divisions at Medmenham—chemistry, physics, hydrology, plant process, and biology—was described and demonstrations were arranged in testing plastic pipes, a detector to locate the "ferret" (a plunger device which water pressure drives along the pipe in order to clean it), and the coagulation process used in the treatment of surface waters to remove particles too small to be filtered out or to settle of their own accord.

BY USING a computer in the design stage of the 11,250 d.w. tons motor ship Arlington Court, the Sunderland shipyard of Bartram & Sons, Limited, took a day to do a job which would have taken a month by conventional methods. The computer, which belongs to King's College, Newcastle-upon-Tyne, was used for hydrostatic and stability calculations.

Record Steel Production by Broken Hill

SUBSTANTIAL increases in production in the past financial year are reported by the Broken Hill Proprietary Company, Limited, the Australian coal, iron, and steel producers. The chairman, Mr. C. Y. Syme, told the annual meeting in Melbourne that production of ingot steel expanded by 6½ per cent. to a record figure and output of pig-iron rose by 13 per cent. During the year, 134,000 tons of pig-iron were exported, mainly to Japan. The company made a profit of just over £A15,000,000.

Production figures for July, 1961, of Broken Hill Proprietary and Australian Iron & Steel (Pty.), Limited, were:—Pig-iron, 288,841 tons; steel ingots, 348,831 tons; bloom and slab mills, 285,555 tons; heavy and continuous mills, 183,018 tons; plate and strip mills, 74,442 tons; merchant mills, 110,448 tons; rod mill, 12,657 tons; cold rolling mills, 2,611 tons; steel foundry (excluding ingots), 1,164 tons; ironfoundries, 9,756 tons; spun pipes, 5,293 tons. Output of coke was 204,538 tons.

US Steelmakers' Reply to President Kennedy

REPLYING to President Kennedy's letter sent to 12 major US steel companies asking them not to increase prices when employees receive a pay increase next month, Mr. R. Blough, chairman of the United States Steel Corporation, has said that his company has formed no definite conclusions regarding the prices it would charge in the foreseeable future.

Mr. Blough claims that if the causes of inflation in the US were sought they would not be found in the levels of steel prices or steel profits and he points out that while prices went up 174 per cent. from 1940 to 1960, hourly employment costs rose 322 per cent. Only once in the past 20 years had the industry's profit level equalled the 8 per cent. level of 1940.

Compaction Solves Unstable Site Problem

UNSTABLE ground conditions posed special problems in Middlesbrough, where a liquid oxygen plant is being built by Simon-Carves, Limited, for British Oxygen Engineering, Limited. The site consists of extremely loose ash and sand, some 15 ft. deep, with firm marl below. Instead of relying on a reinforced concrete raft or on piles, the loose soil is being compacted to 80 per cent. relative density by the vibroflotation process.

After compaction, which will take less than one week, and which is being carried out by the Cementation Company, Limited, the load-bearing capacity will be 3 tons p.s.f.

POLLARD BALL & ROLLER BEARING COMPANY, LIMITED —Profits for the half-year to June 30 rose to £321,000 (£271,000), and the directors have decided to make a rights issue of one 4s. ordinary share for 10 held at a price of 22s. 6d. per share. The proceeds will be used to replace a large part of bank borrowings. An interim dividend is declared of 5 per cent., the same rate as the interim last year, but now payable on capital increased by a scrip issue of one for two.

DRILLING LARGE-DIAMETER BOREHOLES

Experience in the North Staffs Coalfield

by G. BARNSLEY, B.Sc.,* and J. MEACHAM

Equipment used to drill boreholes up to 39½ in. dia. in No. 1 (North Staffs) Area of the West Midlands Division of the National Coal Board is described in this paper, presented to the North Staffs branch of the National Association of Colliery Managers on February 22, 1961. Details are given of the drilling operations at Florence, Stafford, and Sneyd collieries, and a summary made of the bit performance, the accuracy of the boreholes and rates of penetration.

APPLICATION of large-diameter boreholes in underground work in coal mines started several years ago on the Continent, particularly in the Ruhr coalfield, and during the last few years their use has spread to British mines. The original idea behind this technique seems to have been to assist in the sinking of staple pits, but it also is of considerable value for establishing ventilation connections, and dropping stowing dirt between different levels.

Large-diameter boring started in the North Staffordshire Area of the West Midlands Divisional Coal Board early in 1959, using a Nüsse & Gräfer P.30 drilling machine with a team of NCB employees under the control of the Area drilling engineer. To date, four boreholes with diameters of 24 in. or more have been completed.

The first hole was drilled using the machine and equipment as supplied by Nüsse & Gräfer; in later holes some changes were made in the type of bits and steadiers used. The equipment had been used elsewhere before drilling was started in North Staffs, and the bits were partially worn.

The P.30 machine, shown in Fig. 1, has two compressed-air motors, one for drilling and rated at 30 h.p. at an air pressure of 70 lb./sq. in., the other for applying thrust and rated at 18 h.p., their combined air consumption being 1,200 cu. ft./min. The drilling motor is reversible and geared for 20, 40, or 70 r.p.m. The thrust motor can apply thrusts of up to 23 tons. The main components of the machine are the traverse frame, the main assembly, the air spanner and guide roller assembly, and the control table.

The traverse frame is bolted directly to steel joist supports provided in the drilling chamber, so that its long axis is parallel to the line of the pro-

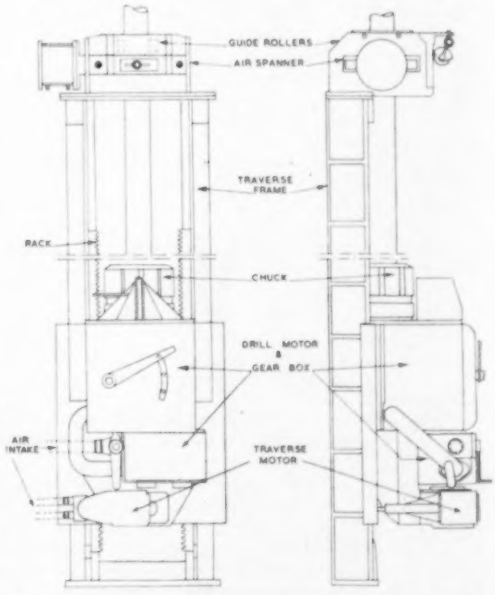


FIG. 1.—DETAILS OF THE NÜSSE & GRÄFER P.30 DRILLING MACHINE.

* Geologist, North Staffs Area, West Midlands Divisional Coal Board.
† Drilling engineer, North Staffs Area, West Midlands Divisional Coal Board.

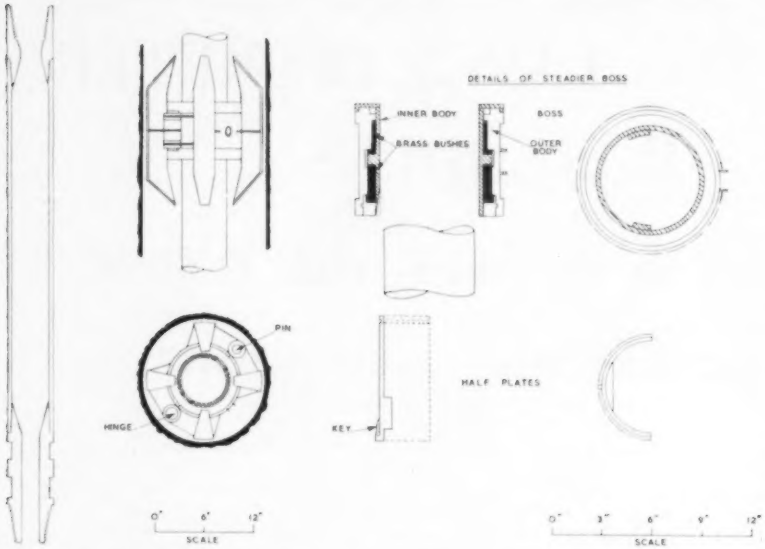


FIG. 2.—CONSTRUCTION OF THE CONVENTIONAL ROD AND STEADIER.

posed borehole. The inner surface of the frame is fitted with removable racks for part of its length, along which the main assembly moves. The traverse frame is 10 ft. 8 in. long, 2 ft. 5 in. wide, and 9 in. thick. The main assembly consists of the two motors and their associated gearboxes, air intakes, and exhausts. The drill chuck into which the drill rods are connected is on the top of this assembly and the whole is moved along the rack of the traverse frame by two pinions driven by the thrust motor.

The air spanner and guide roller assembly bolts on to the top of the traverse frame. The lower part of this unit consists of a spanner actuated by a compressed air cylinder; this spanner engages with the spanner flats on the drill rods and enables the coupling and uncoupling of the rods to be carried out with the aid of the drilling motor. The upper part of this assembly comprises four guide rollers intended to steady the drill rods and keep them on correct line during drilling operations. Also attached to this assembly is a small hoist driven by a 2-h.p. compressed-air motor, which is used to lift the drill rods into position on the drill chuck.

The control table is completely detached from the machine except for air hoses. This is important from the safety aspect, for it enables the machine to be controlled from a sufficient distance to ensure the safety of the operator from falling debris. No person need be in the immediate vicinity of the machine while drilling is taking place. The control table is fitted with valves controlling the drilling and traverse motors, air spanner, and rod hoist, together with the relevant air-pressure gauges.

Drill rods are 5½ in. dia. with an effective length of approximately 5 ft., the ends having taper threads which conform closely to 4½-in. API standards. The minimum internal dia. is 2¼ in. and the maximum 4½ in. Each rod is fitted with a non-return valve suitable for handling normal mine water. Each rod has two spanner flats, machined close to the male end, which the air spanner and drill chuck engage, and into which the steadier bosses fit.

The object of fitting steadiers to the drill rods is to help to keep the borehole straight and to reduce "whip" in the rods during drilling, with its attendant danger of rod breakages. Three types of steadier have been used in North Staffs—guide rod, conventional, and roller.

The guide rod steadiers are normal 5½-in. dia. drill rods fitted with four 1-in. square steel ribs to increase the effective diameter to 7½ in. without interfering with the passage of water and bit cuttings.

Conventional steadiers (shown in Fig. 2) are the type supplied by Nüsse and Gräfer and are designed to remain stationary while the drill rods revolve. There is a clearance of ½ in. or more between the outside of the steadier slides and the wall of the borehole. The cross-sectional area of borehole available to pass bit cuttings and cavings is greatly reduced by these steadiers.

There are three main parts to the assembly:—

(*i*) Two half-plates, which fit tightly to the drill rod and engage in the spanner flats; these rotate with the rod.

(*ii*) The steadier boss, which slips over the half-plate and is kept in position by a key and also a surclip fastening the half-plates where they project above the boss. The inner part of the boss revolves with the rod, the outer remains stationary, the two parts being separated by brass bushings.

(*iii*) The steadier, which is in two pieces hinged together, clamps round the steadier boss and is then secured by a steel pin.

Neither of the above types of steadier is ideal. The guide-rod type, revolving with the rod, acts as a crude reaming bit on making contact with the sides of the hole, and the resulting abrasion both increases the hole size and causes the guide rod to lose its gauge. As a result of this action it eventually ceases to perform its function of keeping the bit straight and steady within the borehole.

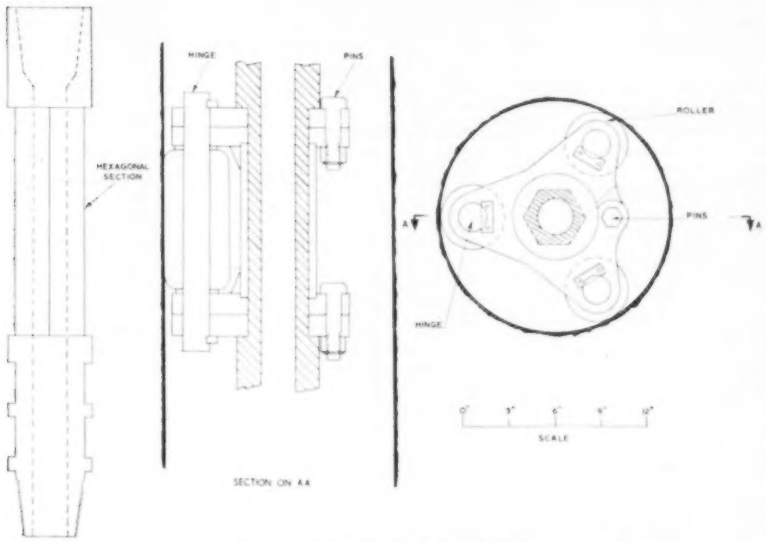


FIG. 3.—THE E.D.E. COMPANY ROLLER STEADIER AND ROD.

The conventional steadiers are not designed to stay in close contact with the borehole, and they permit the drill rods to bend slightly and throw the bit off line. Fitting these steadiers is quite a lengthy process and several times they have become detached from their proper position on the rods and have caused blockages in the borehole.

In an attempt to overcome these difficulties, a roller steadier was designed and was first used in the borehole at Stafford Colliery. Three of the roller steadiers were fitted close behind the 15-in. bit in the pilot hole, in an attempt to keep the bit on line, the remainder of the drill rods still being controlled by the conventional type of steadier.

Roller steadiers, shown in Figs. 3 and 4, are mounted on specially made drill rods 2 ft. 6 in. length, threaded and provided with spanner flats in the same way as normal drill rods, but with a 2½-in. bore throughout. External diameter of the rod is 5½ in., except for a length of 1 ft. 3 in. which is machined down to an hexagonal shape and on which the steadier is mounted.

The top and bottom of this steadier are formed by 2½-in. hinged steel plates, connected by three 1½-in. steel shafts which also carry the 110-mm. dia. 9-in. long, rollers. One of these shafts also serves as the hinge. The rollers are of nylon, which has been treated to prevent swelling when wet. The steel plates are shaped to fit the hexagonal part of the drill rod and are simply clamped round it and secured by two bolts with castellated nuts and split pins. The top and bottom plates are hard faced on the outer edges and fitted with hard metal inserts to enable the steadier to drill itself clear of any blockage caused by rock fragments.

Drilling and Reaming Bits

The Nüsse & Gräfer bits used consist of a 7⅞-in. tricone bit, for drilling the pilot hole, and reaming bits for enlarging from 12 in. to 16 in., 16 in. to 24 in., and 24 in. to 32 in. The reaming bits consist of three roller cutters attached to the drill stem by short, thick arms.

The plate-bit shown in Fig. 5 is designed to increase the hole diameter by 20 in. at a single pass, using two sets of shaft cutters mounted on two plates with a difference in diameter of 10 in. The outer set is of three cutters equally spaced; the inner set originally consisted of two cutters mounted 120 deg. apart. This system of cutter spacing was used as it was believed that a symmetrical bit was subject to excessively rough running due to a form of harmonic motion. In the later boreholes the cutters were mounted, equally spaced, on both plates without any such difficulties arising. The plates, of 2-in. steel, fit over the drill stem and are keyed to it, lock nuts keeping the plates in position.

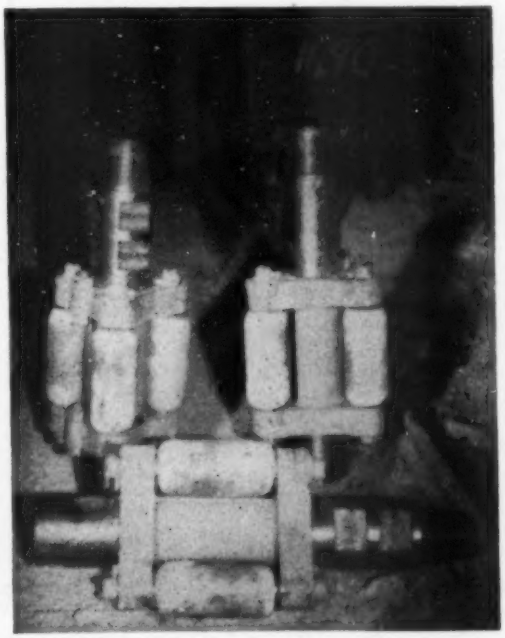


FIG. 4.—ROLLER STEADIERS MOUNTED ON THEIR 2-FT. 6-IN. RODS.

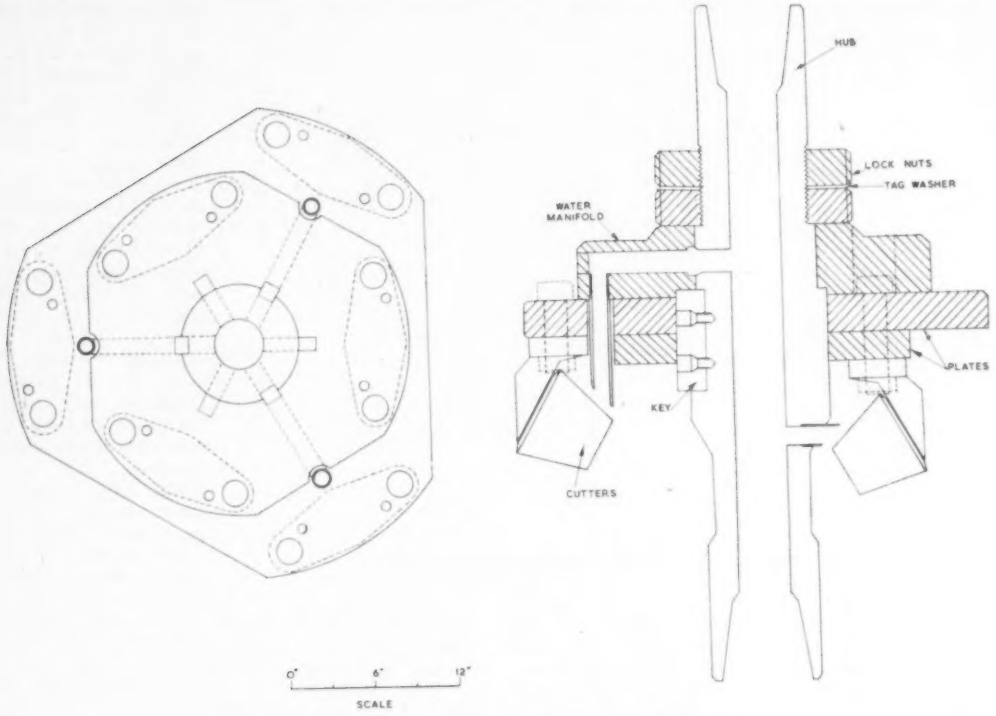


FIG. 5.—PLATE BIT FOR REAMING A 35-IN. DIA. BOREHOLE.

In the original bit, water was passed through holes inside the plates, through the cutter bearings and on to the cutting teeth. With the present bit, water is passed through a manifold and short pipes, directly on to the teeth, thus avoiding unnecessary wear on the cutter bearings due to silty material in the water. The shaft cutters can be replaced individually as required, while the rest of the bit is not expendable. Delivery time for new cutters is a few days.

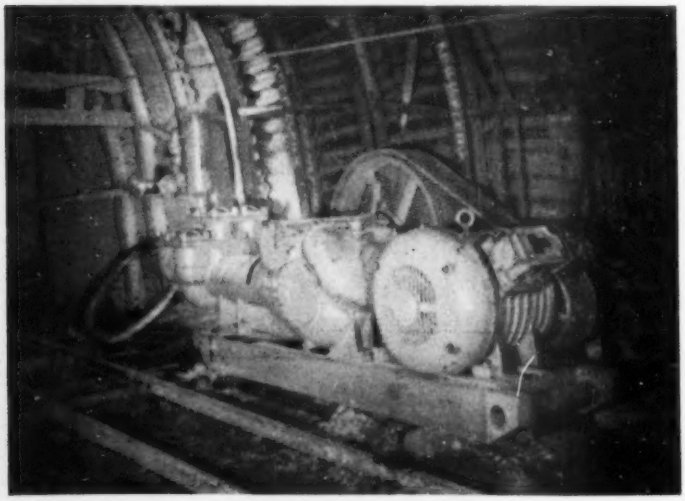


FIG. 6.—EVANS 5-IN. BY 6-IN. PUMP UNDERGROUND AT THE STAFFORD COLLIERY BORING SITE.

Circulating Pumps

For a borehole at Sneyd Colliery a compressed-air-driven Worthington pump was used. This was found to be unable to supply the quantity of water required and also reduced the supply of air available for the drilling machine.

At a shorter borehole at Florence Colliery, Lister and Mono D.10.D. electrically driven pumps were able to supply sufficient water, but it was obvious that neither of these pumps would be able to cope with the heads of 400 ft. or more that would be required in future borings.

To provide an efficient pump

that would not interfere with the running of the drilling machine, it was decided to obtain an electrically driven unit capable of delivering up to 100 gal./min. against a head from all causes of up to 700 ft. The pump chosen was a horizontal Evans 5-in. by 6-in. stroke, 679S., totally enclosed duplex self-oiling pump (size 3), fitted with a 550-V, 30-h.p., 960 r.p.m. flameproof electric motor. This pump was first available for the borehole at Stafford Colliery and is shown in Fig. 6.

Sneyd Colliery Borehole

It was intended to drill a 32-in. dia. borehole up from No. 2 crosscut to the Ten Feet return dip in order to improve ventilation in the former. The borehole was inclined at 70 deg. 30 min. to the horizontal, and was 327 ft. long. Several coal horizons were present, including the Bowling Alley Seam and the Holly Lane goaf, and five beds of sandstone were met with a total thickness of 105 ft. The full dip of the strata was approximately 1 in 4.5, with the measures rising at 1 in 13 on the line of the borehole.

The drilling machine was mounted on a triangular framework of 8-in. by 6-in. steel joists attached by ragbolts to a 2-ft. thick concrete block sunk into the floor of the 14-ft. high roadway. The apex of this framework was secured by a 8-in. by 6-in. crosspiece to two 8-in. by 6-in. steel joists set across the roadway, 6 ft. apart and 7 ft. 9 in. above the floor. The framework was made and set up so that the side to which the machine was bolted was inclined at the same angle as the borehole. A water tank to hold 1,250 gal. was made at the side of the drilling framework, the tank being divided into two, one part receiving the return water from the borehole and acting as a settling tank, and overflowing into the second part, from which the water was again pumped up the borehole. A mud tray was mounted above the machine to collect the return water and drilling debris, which were then discharged through a 9-in. pipe directly into a tub standing on rails laid over the settling tank.

Erection of the machine began on March 27, 1959, and drilling started on April 10, with a 7⅞-in. tricone bit. After 40 ft. had been drilled, two shifts were lost while the mud tray and its disposal pipes were adjusted to give a steeper fall and prevent the drill cuttings causing blockages. When 215 ft. had been drilled it became apparent that insufficient water was reaching the drill bit. The pump in use at this time was the Worthington-Simpson with compressed-air drive, which proved unable to supply sufficient water against heads in excess of 200 ft. on the available air supply.

Three shifts were lost while unsuccessful attempts were made to improve the performance of the Worthington-Simpson pump or to find a more suitable type. Drilling was continued, using water from the colliery range to boost the supply from the pump, but the quantity reaching the bit was still inadequate and only slow progress could be made. The borehole finally thirled into the upper level on May 6, 2 ft. 3 in. from its intended position.

The pilot bit was replaced by a 12-in. reamer and reaming down was started and completed in seven shifts without difficulty. Pushing the rods up to the top of the borehole, removing the 12-in. reamer, and fitting the 16-in. reamer took a further two shifts.

Reaming down with the 16-in. bit started on May 21 and was completed in six shifts. Replacing the 16-in. reamer with 24-in. and 32-in. bits coupled in tandem, and a few minor repairs, took another four shifts.

The final reaming to give a 32-in. dia. finished hole started on June 3, but after drilling 24 ft. progress became very slow. The reamers were examined, but, apart from a rather inadequate water supply, there appeared to be nothing wrong. Attempts to improve the water supply failed. A further attempt to drill produced no better results, and so the 32-in. reamer was taken off, but drilling with the 24-in. reamer alone showed no improvement. At this point three half-plates out of the steadiers fell to the bottom of the hole and it was thought that at least two steadiers were loose and probably blocking the hole, thus causing the slow drilling. To check this, the 24-in. reamer was taken off, and the rods with the 16-in. reamer attached were lowered without difficulty to a point 20 ft. below that reached by the 24-in. reamer. This seemed to indicate that there was no blockage delaying the drilling.

The 24-in. and 32-in. reamers were put on again and drilling resumed, additional water being supplied from the top of the borehole. Progress, however, remained very slow at between 2 ft. and 9 ft. per shift.

On July 9, when 103½ ft. had been reamed out to 32 in., the return water ceased, showing that a major blockage had occurred in the borehole. Attempts to free the blockage using the 12 in. reamer failed, it proving impossible to come below a point about 110 ft. up the borehole.

The 24-in. and 32-in. reamers were now taken off the rods at the upper level and the 24-in. brought to the bottom of the borehole and coupled into the string of rods, with the intention of reaming up to clear the blockage from below. Reaming up started on July 17 and after drilling 68 ft. the bit was withdrawn from the hole for examination. A damaged steadier boss was recovered from above it, the steadier itself remaining jammed in the borehole. Heavy falls of debris and broken steadier parts started as the bit was being pushed back up the borehole. When these ceased, drilling was continued up to 83 ft., when the machine stalled and no further drilling was possible. On trying to withdraw the reamer it was found that the rod immediately below it had broken and was wedged between the reamer and the side of the borehole. The rods were freed with some difficulty and the 24-in. reamer, the rods above it, six steadiers, and rock debris fell on to the top of the machine.

After removing the fallen debris and equipment, the borehole was found to be clear. Meanwhile, the 24-in. reamer had been repaired sufficiently to be used for reaming down without the 32-in. reamer attached. Reaming down started again on August

24 and the remaining 141 ft. of reaming down to 24-in. was completed in 10 shifts.

It was decided not to attempt any further reaming out to 32 in. dia. and drilling ceased on September 2, the machine being dismantled in seven days.

Florence Colliery No. 1 Borehole

The borehole at Florence Colliery was to assist in ventilating the south-eastern horizon drivage from which it was drilled vertically upwards for 193 ft. to a road in the Yard Seam goaf.

All the Nüsse & Gräfer type bits were in poor condition at the end of the Sneyd borehole, and in order to reduce the cost and the delivery time of replacements, it was decided to drill a 17½-in. dia. pilot hole and then ream it to 37½-in. dia. in one stage, using a plate bit, made in the Area workshops, fitted with replaceable shaft cutters made by Hughes Tool Company. It was hoped that the plate bit would give faster penetration times than the 24-in. and 32-in. reamers used in tandem, while the 17½-in. pilot hole would eliminate the 12-in. and 16-in. reaming stages. A 17½-in. pilot hole was considered necessary to ensure clearing the cuttings from the 37½-in. reaming stage without blockages forming on the steadiers.

A drilling chamber approximately 13 ft. long. 12 ft. wide, and 17 ft. high was made at the side of the south-east drivage, and water tanks, similar to those at Sneyd, were sunk under the adjacent tub track. A 10-in. by 10-in. steel joist was laid on the floor of the chamber, parallel to the roadway, and the sides of the chamber were bricked. The machine was bolted onto the top of the 10-in. by 10-in. girder and onto 8-in. by 6-in. steel joists situated near the mid point and top of the traverse frame. All the girders were let into the brick walls and finally cemented in after the surveyors had checked position and verticality.

Only 5 ft. of coal was met in the borehole, but 60 ft. of hard strata (sandstone and rock binds) were present. The dip of the strata was 1 in 10.

Erecting the machine started on November 12, 1959, and drilling started on the 30th; the pilot hole was completed in seven shifts without difficulty, thirling 4 ft. 4 in. from the intended position. A Lister pump was used during this phase, but was replaced by the more powerful Mono D. 10 D. type for reaming. Wear on the 17½-in. tricone bit was negligible.

After making safe the top of the borehole, reaming down started on December 16. Good progress was made for 62 ft., after which the progress rapidly decreased until at 91 ft. it virtually ceased. Examination of the bit showed that the outside cutters were loose and had been binding on the side of the borehole, so that the backs of the cutters were severely abraded and new cutters had to be fitted; also, the plates beneath the cutting feet were badly indented. The bit was taken back to the Area workshops for repair; fresh bolts of better quality steel were fitted and the plates milled level.

After a delay of eight days the repaired bit was returned to the pit, but after a further 13 ft. of drilling the plates became detached from the central hub, due to failure of the lock nut. Fishing operations started on January 14, 1960, and by the 28th several fishing tools had been broken, with no useful results. It was then decided to accept an offer by Hughes Tool Company to modify a 39½-in. plate bit for upward reaming and to ream up, so completing the borehole and recovering the plates in one operation. The new plate bit was delivered on February 16, but in the meantime the plates had been recovered from the borehole and an attempt to use the Nüsse & Gräfer 24-in. reamer had only resulted in the collapse of its cutters. The top of the borehole was now in a very poor condition and 9 ft. of 36-in. steel tubing had to be inserted and much other work done to make it safe.

Reaming up started on February 24 and 96 ft. was drilled in 18 shifts, taking the 39½-in. dia. hole several feet into the old 37½-in. hole. Between 47 ft. and 57 ft., broken bolts occurred in the outside cutters on three occasions; those finally used were of steel with an ultimate tensile strength of 80 to 85 tons and were fitted with Nylock nuts. Drilling ceased on March 15 and dismantling was completed on the 23rd.

As a result of the failure of the original plate bit, which was made in Area workshops from carbon steel, and considerable bolt trouble on the second plate bit, which was made from E.N.9 steel, consultations were held with Hughes Tool Company, and Wilsons Pipe Fittings, Limited. A new plate bit was designed, using E.N.19 steel for the plates, hub, etc., and E.N.25 steel for all bolts. Two dowels were also fitted to each cutter. Investigations into the operation of the machine showed that, due to some misunderstanding, drilling had been carried out in top gear (70 r.p.m.) when using the plate bits, instead of in bottom (20 r.p.m.), thus causing unnecessarily high peripheral speeds and consequently undue strain on the outer cutter bolts.

Stafford Colliery Borehole

The borehole at Stafford Colliery was the first at which the new pump, roller steadiers, and plate bit were available; the need for this equipment had been amply demonstrated by the experiences at the earlier borings. This boring was carried out quickly, efficiently, and cheaply, and was entirely successful.

The boring was to assist the sinking of a staple shaft from the south-west Moss development to the 7,700-ft. horizon. It was 356 ft. long and drilled vertically upwards from the previously prepared bottom of the staple pit. Support and water tank arrangements were similar to those at Florence Colliery, save for the addition of an extra 8-in by 6-in. girder to support the traverse frame.

All seams from Five Feet to the Hams, totalling 20 ft. of coal, were present in this borehole, together with 70 ft. of sandstone and rock binds. The dip of the strata was 1 in 12. In order to help to reduce the peripheral speed on the plate bit the pilot hole was reduced to 15 in. dia. and the new plate bit designed to ream out to 35 in.

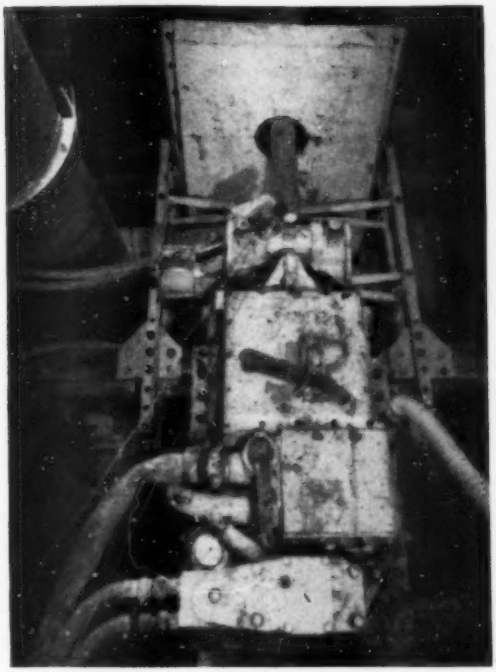


FIG. 7.—P.30 BORING MACHINE, COMPLETE WITH MUD TRAYS, RODS, AND 15-IN. TRICONE BIT, READY TO START DRILLING AT THE STAFFORD COLLIERY SITE.

Erection of the machine started on June 1, 1960, and drilling on the 8th (Fig. 7), the pilot hole being completed without incident in six shifts, thirling 4 ft. 9 in. from the intended point. After making safe the top of the borehole, reaming down started on June 24 and took 19 shifts. The plate bit was examined at 128 ft. and again at 225 ft. On the first occasion the bolts in the outside cutters were slightly loose and were replaced; the water manifold had also moved, shearing the water pipes; fresh pipes were fitted and the manifold dowelled into the top plate. The second examination showed the bit to be in good order. Five shifts were lost by these two examinations and the repairs.

Drilling was finished on July 14 and the machine was dismantled by July 21. The 15-in. tricone bit was found to be slightly worn, the plate bit cutters about 50 per cent. worn with the backs of the outer set rather abraded; the nylon steadier rollers had been reduced in diameter by 3 mm.

Florence Colliery No. 2 Borehole

The second borehole at Florence Colliery was to assist in sinking a staple pit from 16s Moss to the Black Lake crut. It was drilled vertically upwards from a previously prepared staple-shaft bottom for 418 ft. The borehole had to pass through the Yard-Ragman goaf at about 242 ft.; not much coal was encountered (about 8 ft.), but at least 130 ft. of hard strata (sandstone and rock binds) were present. The average dip of the measures was 1 in 16.

The 15-in. tricone bit used at Stafford (Fig. 8) was used in this boring, and the 35-in. plate bit had a new set of outer cutters fitted. The method of support for the machine and the layout of the water tanks were similar to those at Stafford Colliery.

Erection of the machine started on September 9 and drilling the 15-in. pilot hole on the 16th. After seven shifts work, a total of 249 ft. had been drilled when continual caving in the vicinity of the Yard-Ragman goaf resulted in several blockages in the borehole. No further progress could be made without a serious risk of having bit and rods jammed in the borehole and lost. All steadiers were removed from the rods and the rods and bit pushed back up the borehole to the level of the bottom of the goaf, so as to form a plug while a scouring was driven to the position of the borehole and the goaf secured against further collapse.

The scouring reached the borehole position on October 19 and found it to be 14 ft. 6 in. off line, and it was decided to cement it up and drill again in the same position with a $7\frac{7}{8}$-in. bit in an attempt to make a straighter hole. Making safe the top of the 15-in. hole, filling it with cement, and waiting for the cement to harden took until October 24.

Drilling up to the scouring with the $7\frac{7}{8}$-in. bit took five shifts, the bit emerging in the centre of the original 15-in. hole. The machine was now moved 2 ft. 9 in. to the side of the original hole and it was decided to drill a $7\frac{7}{8}$-in. pilot hole, and to ream it first to 15-in. and then out to 35-in.

FIG. 8.—THE 15-IN. HUGHES TOOL COMPANY TRICONE BIT, TYPE O.W.S., AS USED AT STAFFORD COLLIERY.

dia. A 7⅛-in. to 15-in. reaming bit was made in the Area workshops by welding three cutters from a partially worn 7⅛-in. roller bit on to the stem of one of the old Nüsse & Gräfer reamers, with the top of the stem projecting beyond the cutters to carry the 7⅛-in. bit as a "leader" while reaming.

Drilling with a 7⅛-in. tricone bit started from the new position on November 7 and the scouring was reached after four shifts drilling. The borehole was still 4 ft. off line, far more than the permissible error at this height, and a diversion bracket was made to force the drill rods over far enough to correct this deviation by the time the top of the boring was reached. The final height of 418 ft. was reached on November 15 after another five shifts drilling, and it was found that the diversion bracket had curtailed, but not corrected, the rate of deviation, the top of the boring being 5 ft. 6 in. from its intended position.

Reaming up with the 15-in. reamer started on November 17 and at the same time the pump started to give trouble, building up sudden pressure and blowing the hoses off. No lasting remedy was found for this until the 15-in. reamer was taken off. The final 120 ft. was drilled with the 15-in. tricone bit, which followed the original hole quite accurately, although it had no "leader"; the 15-in. hole was completed on December 15.

Reaming down with the 35-in. plate bit started on December 16 and finished after 28 shifts when a rod broke, with 18 in. left to drill. The final 18 in. was removed by shotfiring and the bit recovered without much difficulty. During reaming down a blockage occurred just below the scouring which took one and a half shifts to clear, and the pump suction became blocked several times, due to large amounts of drilling debris entering the water tanks. Drilling finished on January 9, 1961, and the machine was dismantled by January 12.

Penetration records of the boreholes at Stafford and Florence collieries are shown in Fig. 9.

The 15-in. tricone bit suffered little extra wear during the drilling at Florence. The inside set of cutters on the 35-in. plate bit were slightly worn; the outside set were about 50 per cent. worn and had suffered severe abrasion on the backs.

Comments

The P.30 machine has proved robust and is supplied with ample power for all the work attempted. It is capable of drilling with a 39½-in. plate bit, cutting an area of 6.6 sq. ft. in strong strata, at penetration rates of about 4 ft. per hour.

No major breakdown has occurred on the machine during drilling operations, but certain parts, *e.g.*, rack and pinion, air spanner jaws, and chuck jaws, seem subject to considerable wear, and as replacements have taken anything up to four months to arrive, a fairly large stock of spare parts has to be kept.

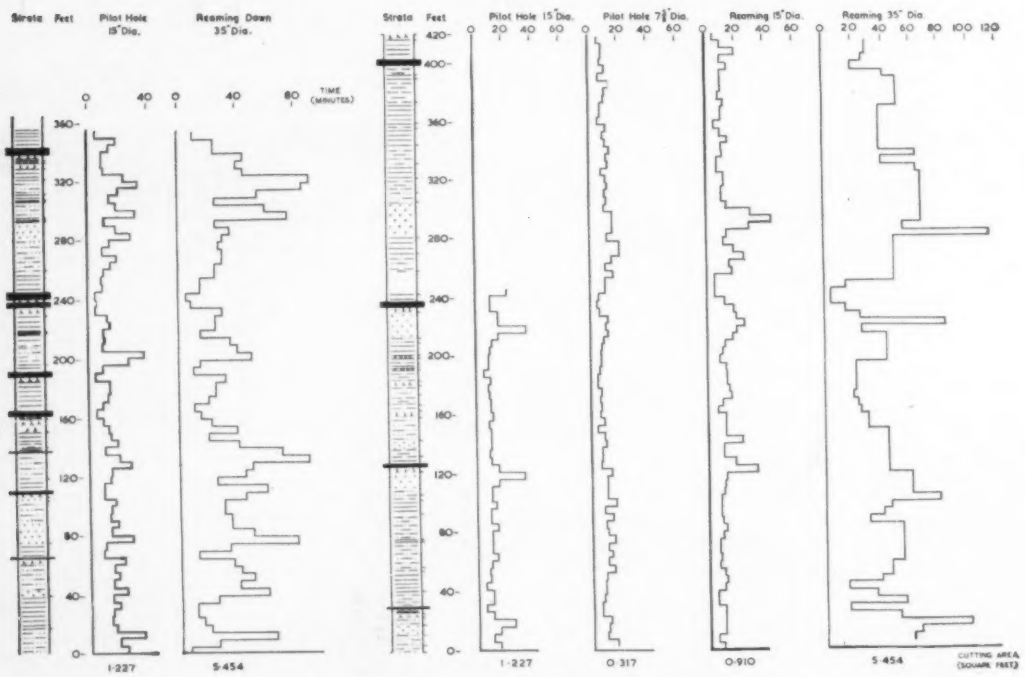


FIG. 9.—PENETRATION RECORDS WHEN DRILLING LARGE-DIAMETER BOREHOLES AT FLORENCE AND STAFFORD COLLIERIES.

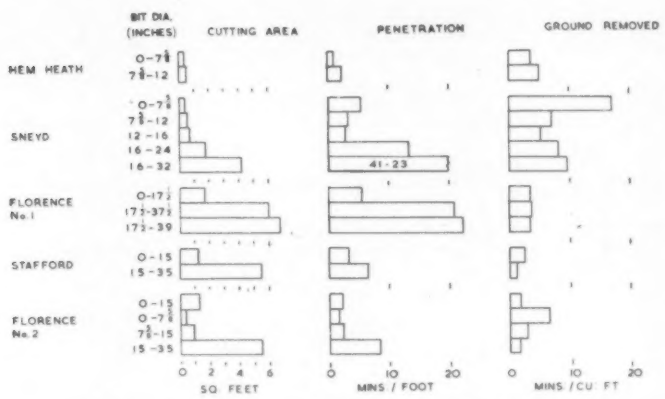


FIG. 10.—SUMMARY OF BIT PERFORMANCE IN NORTH STAFFS.

A bottom gear of 10 or 12 r.p.m. on the drilling motor would be an advantage, especially when the larger diameter bits are in use, while the top gear of 70 r.p.m. is seldom used.

An examination of bit performance (Fig. 10) shows that although penetration rates become slower when drilling with the larger diameter bits, the decrease is not in the same proportion as the increase in the area cut. A 35-in. plate bit cutting an area four-and-a-half times that cut by a 15-in. tricone bit will take about twice as long to drill 1 ft., while, at Florence No. 2 Borehole, a 15-in. tricone drilled 250 ft. in 9 hr. 55 min., but a 7⅞-in. tricone bit followed by a 15-in. reamer took 16 hr. 25 min. to complete the same work, through the same strata. The larger bits are far more efficient in terms of time taken to cut a cubic foot of strata, a 7⅞-in. tricone taking twice as long as a 15-in. tricone, and three times as long as a 35-in. plate bit.

Variations in the strata passed through cause wide fluctuations in penetration rates; from about 3 min. per 5-ft. rod in coal to 15 min. in hard strata for a 7⅞-in. bit, and 5 min. in coal to 110 min. in hard strata for a 35-in. plate bit.

The tricone bits used for the pilot holes were largely the O.W.S. type made by Hughes Tool Company. Designed for use in medium/hard abrasive strata, all gave good service. The 15-in. tricone has drilled 725 ft. to date and is capable of further use.

The reaming bits supplied with the machine probably did not have a fair chance in the Sneyd Colliery borehole, owing to the persistent water difficulties, but it seems economically unsound to use these more expensive bits and take four passes to form a 32-in. hole when a 35-in. hole can be drilled in two passes with cheaper equipment.

The difficulties encountered with the first two plate bits were unexpected, and so far as the authors are aware, unprecedented. They added appreciably to the time and cost of the Florence No. 1 borehole, but were successfully overcome in time for the Stafford borehole. This was achieved by a combination of improved design, the use of better quality steel, and the reduction of the peripheral speed during drilling from 723 ft./min. to 186 ft/min., giving a better weight/speed ratio on the bit.

Accuracy has proved to be a major obstacle in large-diameter drilling; for staple-shaft boreholes an error of no more than 0 deg. 34 min. (1 in 100) is desirable, and so far this cannot be guaranteed.

An analysis of the deviations of the North Staffs boreholes (Fig. 11) shows, as in the case of the Ruhr boreholes, a strong tendency for the hole to deviate to the dip, but no connection has been established between the rate of dip and the rate of deviation. The machine may have a tendency to deviate the borehole to the left, but this is not clearly defined.

Two features of the machine would seem to be against accurate drilling. The guide roller assembly, the top control point for the rods, is normally some 4 ft. below the roof of the drilling chamber, and, even when new, these rollers have a clearance of nearly ¼ in. over the drill rod diameter, thus failing to provide a rigid control for the rods. The drill chuck, which forms the bottom control point

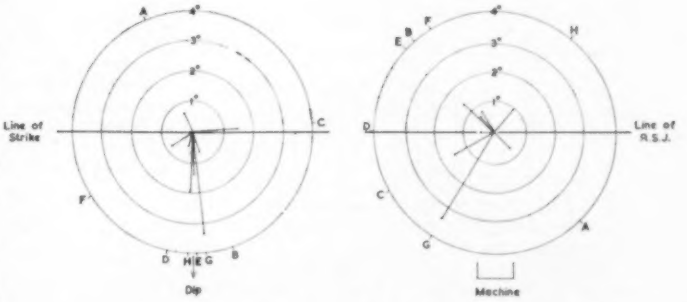


FIG. 11.—ANALYSIS OF BOREHOLE DEVIATION IN RELATION TO THE INCLINATION OF THE STRATA AND THE POSITION OF THE DRILLING MACHINE. THE LETTERS A, B, C REFER TO THREE SHORT HOLES NOT DISCUSSED IN THE PAPER. D REFERS TO THE SNEYD COLLIERY LARGE-DIAMETER BOREHOLE, E TO THE FLORENCE COLLIERY NO. 1 BOREHOLE, F TO THE STAFFORD COLLIERY BOREHOLE, G TO THE FLORENCE COLLIERY NO. 2 BOREHOLE (FIRST ATTEMPT WITH 15-IN. PILOT HOLE), AND H TO THE FLORENCE COLLIERY NO. 2 BOREHOLE (SECOND ATTEMPT WITH 7⅞-IN. PILOT HOLE).

TABLE 1.—*Details of Performance of Drilling Large-diameter Boreholes in North Staffordshire.*

	Sneyd.					Florence No. 1.			Stafford.		Florence No. 2.			
	Drilling.	Reaming.			Finished hole.	Drilling.	Reaming.	Finished hole.	Drilling.	Reaming.	Finished hole.	Drilling.	Reaming.	Finished hole.
Dia. drilled or reamed (in.)	7⅞	7⅞ to 12	12 to 16	16 to 24	24 and 32	17½	17½ to 37½	37½ and 39½	15	35	35	15	7⅞ to 15	35
Length drilled or reamed (ft.)	327	327	327	224	103	193	104	193	356	356	356	249	418	418
Cutting area (sq. ft.)	0.317	0.468	0.614	1.742	4.187	1.670	5.997	6.625	1.227	5.454	6.681	1.227	0.910	5.454
Volume excavated (cu. ft.)	103.6	153.0	200.7	390.1	431.3	322.3	624.7	579.6	436.9	1,941.6	2,378.5	305.5	377.4	2,279.8
Time spent in hr. and min.:														
Drilling	29-25	18-00	17-00	53-15	70-45	18-30	36-20	33-00	87-50	19-35	59-15	9-55	13-25	16-50	60-50
Ancillary operations	10-10	10-55	9-50	6-55	11-45	12-00	34-15	13-55	59-10	23-15	39-20	17-15	12-00	32-05	95-40
Delays	87-0	13-50	30-30	209-50	160-00	12-00	113-05	70-00	387-35	31-10	85-20	17-10	29-30	100-15	397-50
Total time on site	126-35	42-45	57-20	270-00	242-30	42-30	183-40	116-55	*534-35	74-0	134-10	208-10	44-20	55-15	149-10	186-35	*588-50
Rates of progress, min./ft.																	
Drilling	5.40	3.30	3.12	14.27	41.21	5.75	20.96	22.25	27.31	3.30	9.98	2.39	1.92	2.42	8.73	14.50
Drilling and ancil. operations	7.27	5.31	4.02	16.12	48.06	9.48	40.72	31.60	45.70	7.22	13.31	6.55	3.65	7.02	12.85	27.41
Overall time on site	23.23	7.85	10.52	72.32	141.26	13.21	105.96	78.82	166.16	12.45	22.62	10.68	7.93	21.41	26.78	84.50
Rates of excavation, min./cu. ft.																	
Drilling	17.04	7.06	5.08	8.18	9.85	8.84	3.45	3.49	3.41	3.45	2.69	1.22	1.49	1.94	6.05	2.68	1.60	2.17
Drilling and ancil. operations	22.92	11.34	8.05	9.24	11.49	11.16	5.68	6.77	4.85	5.77	5.88	2.44	3.07	5.33	11.46	7.78	2.35	4.11
Overall time on site	73.31	16.76	17.14	41.43	33.76	34.68	17.63	17.92	12.09	21.01	10.16	4.14	5.25	8.69	24.92	23.74	4.91	12.67

* Includes additional time or major delays not assessed to any particular stage.

for the rods during drilling, moves up towards the guide rollers as each rod is drilled, so that a maximum controlled length of 5½ ft. decreases to only 6 in. at the end of each rod. Setting off a 400-ft. borehole on a minimum base of 6 in. having a possible error of ¼ in. at one end, is hardly conducive to accuracy. These facts probably contributed to the excessive error on the first 15-in. hole at Florence No. 2 borehole, as there is some reason to believe that the drill rods were 1 in. in 4 ft. off vertical at the start of the borehole.

During the drilling of the pilot hole the drill rods are, of necessity, in compression and as a result a column of rods will tend to become curved, in so far as the steadiers or hole diameter will permit, and so push the drill bit off line. One of the chief functions of the target rods and roller steadiers should be to control this rod curvature and the resulting bit deviation, as well as the tendency of the bit to move to the dip. As yet, they have not been completely successful in this respect.

Little information is available as to exactly where and how any of the boreholes started to deviate, but it is hoped that measurements taken during the sinking of the staple pits will be of value.

Table 1 gives details of performance at the four boreholes discussed in this paper. The overall time spent on site is broken down into:—

(*a*) Drilling.

(*b*) Ancillary operations, including coupling and uncoupling rods, fitting steadiers, changing bits, etc.

(*c*) Delays, including major breakdowns and also minor delays for such things as maintenance, waiting for tubs, standing while power or water is cut off.

Performance is then examined in terms of time spent in hours on the various operations, time taken to complete 1 ft. of borehole, and time taken to excavate 1 cu. ft. of strata.

The time taken at all the borings except that of Stafford is inflated by major breakdowns. The results of the Stafford hole show that is should be possible to complete a 35-in. dia. borehole at a rate of 1 ft. per 30 min. of time spent on site, that is, about 70 ft. per week of five working shifts. An additional week is required both for erecting and dismantling.

Table 2 shows the breakdown of costs for the

TABLE 2.—*Cost of Drilling Large-diameter Boreholes in North Staffordshire.*

	Sneyd borehole.	Florence No. 1 borehole.	Stafford borehole.	Florence No. 2 borehole.
	£	£	£	£
Labour	1,236	1,032	372	1,188
Bits	878	1,040	249	456
Repairs and renewals	836	710	313	907
Power	207	97	65	111
Depreciation	519	447	217	483
Cost of drilling	3,676	3,326	1,216	3,145
Erecting	218	210	114	95
Dismantling	118	103	95	84
Total cost	4,012	3,639	1,425	3,324
Cost per foot	£12 5s. 5d.	£18 17s. 1d.	£4 0s. 0d.	£7 19s. 6d.

four boreholes discussed. Major breakdowns greatly increased the costs of labour, bits, repairs, and renewals for the Sneyd, Florence No. 1, and Florence No. 2 boreholes. The results for Stafford show that a cost of as low as £4 per foot can be obtained.

The position now reached in the North Staffs Area is that mechanical difficulties with the equipment seem to have been largely overcome, but the desired accuracy cannot yet be guaranteed. When the accuracy problem has been solved it should be possible consistently to drill 35-in. boreholes at the rate of 70 ft. or more per five working shifts, and at a cost of rather less than £4 per foot.

The authors wish to thank Mr. H. J. Widdowson, Area general manager, No. 1 (North Staffordshire) Area, West Midlands Divisional Coal Board, for permission to give this paper. Any opinions expressed are those of the authors and not necessarily those of the board.

Water-jet Mining of Coal

RESEARCH to determine whether coal in the State of Washington can be mined with jets of water will be undertaken as a joint venture of the US Bureau of Mines and the Northern Pacific Railway Company, the owner of a mine at Roslyn, 70 miles east of Seattle.

Hydraulic mining is sought as the answer to difficult problems in producing coal from steeply pitching beds encountered in the Roslyn mine and other mines in Washington. The Bureau of Mines has studied hydraulic mining of bituminous coal in a mine in central Pennsylvania. This operation differs from that contemplated in Washington State because the Pennsylvania coal bed is nearly horizontal. In the Washington experiments, a pump capable of supplying water at pressures up to 4,500 lb./sq. in. will be installed. The nozzle output will be about 40 gal./min. The Pennsylvania tests showed that eastern bituminous coals broke readily at lower pressures, but with larger volumes of water.

The bureau has begun a similar hydraulic project in Pennsylvania's anthracite region, also characterized by steeply pitching beds and likewise faced with the difficulty of using conventional mining machinery. The anthracite test will involve pressures of 5,000 lb./sq. in. and 300 gal. of water per minute.

Cobalt-platinum Permanent Magnet Alloy

Johnson, Matthey & Company, Limited, 78-83, Hatton Garden, London, E.C.1, has issued a new data sheet describing its cobalt-platinum permanent magnet alloy Platinax II. This material is the latest developmen in magnetic alloys of the cobalt-platinum system, and with a BH (max.) of 9.2 by 10^6 gaussoersteds is one of the most powerful permanent magnet materials known. Before its final heat treatment it can be rolled, drawn, or machined without difficulty. The new publication gives information on the heat-treatment process, on reversible permeability, and on behaviour at elevated temperatures. Copies of the data sheet are available on request.

Speed Control of Mine Cars

RICHARD SUTCLIFFE, LIMITED, Horbury, Wakefield (Yorks), announces the introduction of the Rotarder (Fig. 1)—a completely self-contained hydraulic device to give speed control of a train of tubs or mine cars. The system contains the Rotarder, header tank, and one or two valves as required.

The oil is fed by gravity from the header tank into the Rotarder body which is completely filled with the selected grade of oil.

As the tub axle pushes the star wheel the rotor revolves, and, acting as a pump passes the oil along the return line back to the header tank. A gate valve is fitted in this return line, the closing of which causes a higher pressure to be generated in the Rotarder with the oil passing either up the restricted return, or short circuited past the brushes,

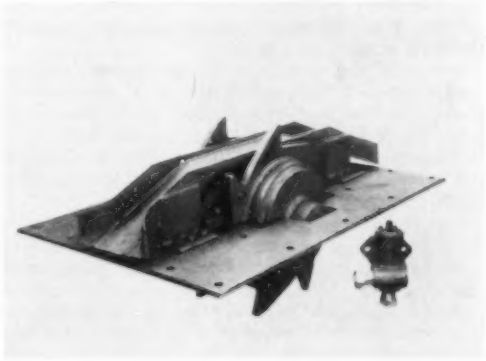


FIG. 1.—HYDRAULIC ROTARDER AND QUICK-RELEASE VALVE.

or down the sides of the rotor. With the valve completely closed, all the oil is short circuited and the maximum retardation condition is obtained.

A pull-wire operated quick-release valve is fitted as an optional extra, in the return line to by-pass the gate valve. This immediately relieves the pressure in the Rotarder in any circumstances, and allows sluggish tubs to be passed through. The operation of this valve can be achieved from any convenient position by means of the pull-wire, and does not affect the original setting of the Rotarder.

If tubs are required to be run or pulled through the Rotarder in the reverse direction, the stator is so arranged that the oil has a free flow past the rotor blades and, therefore, the resistance to rotation is kept at a minimum.

HIGH-SPEED ELECTRONIC WEIGHER

FIRST electronic weighing-in-motion system to be installed in a steel mill anywhere in the world was recently shipped from the Yonkers, New York, plant of Fairbanks, Morse & Company to the Great Lakes Steel Corporation's new mill now under construction at River Rouge, a suburb of Detroit. It will record the weights of railway wagons as they move into the mill with raw materials, or out with finished products—without interrupting production flow.

The new system is a development of the Fairbanks Morse company's weighing-in-motion systems already installed in railway marshalling yards, and at an iron mine and a coal mine. Great Lakes Steel has so designed its new mill that all inbound and outbound traffic can be weighed. The system has therefore been designed for two-directional motion weighing. It employs an 80-ft. mechanical-lever railway track scale linked to strain gauge load cells. A servo system converts electric signals into printed weights in 3 sec.

One of the problems in developing advanced weighing-in-motion techniques is to remove vibration. Fairbanks Morse called upon past experience to develop lever-damp assemblies which resist vibration to the load-receiving element. Damping techniques were also applied to the electronic amplifiers to shut out unwanted signals.

When the mill goes into operation later this year, it will produce steel coils up to 80 in. wide and weighing up to 40 tons. The new rolling mill is part of the $300,000,000 expansion programme being completed this year by the National Steel Corporation, parent company of Great Lakes Steel.

REVISION OF STANDARD FOR SAFETY VALVES

THE British Standards Institution has revised and enlarged BS 1123, giving specifications for safety valves, gauges, and other safety fittings for air receivers and compressed-air installations. Although the main provisions of the standard remain unchanged, modifications have been made to secure co-ordination with the 1955 edition of revised BS 759—"Valves, Gauges, and Other Safety Fittings for Application to Land Boilers and Piping Installations for and in Connection with Land Boilers."

The most important of these modifications is the permissible use of safety valves having an established discharge greater than provided for by the minimum aggregate area formula.

The revision also includes a comprehensive specification covering the requirements for safety valve springs.

The price of the standard is 4s.; copies may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1.

Mexican Steel Industry's Expansion

ACCORDING to a report published by Nacional Financiera, the Mexican iron and steel industry made notable progress in 1960. The output of steel ingots was four times the figure for 1950, and more than twice that for 1955.

In 1960 the production of steel ingots increased by 16 per cent. over 1959, reaching 1,539,537 metric tons, in comparison with 1,327,752 tons, while the output of pig-iron rose by 23.1 per cent. in the same period (from 631,227 to 777,265 metric tons).

Expanding from 233,072 metric tons in 1959 to 294,154 tons the following year, sheet steel continued to occupy first place among the intermediate manufactures group. Steel plate production rose from 124,756 to 136,173 metric tons, tinplate production to 64,907 from 60,670 tons.

Increased production of steel in Mexico has not met all the demand arising from expanding industrialization. At 690,412 metric tons, 1960 imports of iron and steel products increased by 19.5 per cent. over the previous year's level of 577,523 tons. Apparent consumption of steel in Mexico in 1960, in terms of steel ingots amounted to 1,926,237 metric tons, and was supplied by domestic production to the extent of 80 per cent., net imports accounting for the remaining 20 per cent. Ten years earlier these proportions were 51 per cent. and 49 per cent.

Mexico aims to raise its steel production capacity to 4,105,000 metric tons by 1965.

Scottish Refresher Course for Plant Engineers

NEXT in the series of comprehensive refresher courses for works and plant engineers, organized by the Institution of Plant Engineers, is to be held in Scotland this winter, at the Institution of Engineers and Shipbuilders, 39, Elmbank Crescent, Glasgow, C.2. Sponsored by Sir Andrew McCance, chairman of Colvilles, Limited, and chairman of the board of governors of the Royal College of Science and Technology, and available to all engineers who wish to take advantage of it, the course comprises 18 weekly lectures on Wednesday evenings, starting on November 1.

The syllabus covers a wide range of subjects, treated by specialists drawn, in the main, from industry. Designed to encourage the most effective use of existing knowledge and to promote the application of up-to-date techniques in works engineering practice over a broad field, its purpose is to help works and plant engineers to make the fullest possible contribution to increasing productivity. Fee for the course is £4 4s. and copies of the syllabus and full particulars may be obtained from the Secretary to the Refresher Course, 39, Elmbank Crescent, Glasgow, C.2.

ISI Special Meeting in the USA and Canada

AERIAL VIEW OF JONES & LAUGHLIN STEEL CORPORATION'S ALIQUIPPA WORKS DIVISION, LOCATED 20 MILES FROM PITTSBURGH ON THE OHIO RIVER.

Aliquippa Works of the

JONES & LAUGHLIN STEEL CORPORATION

The Jones & Laughlin Steel Corporation was formed at the start of the present century by the merger of Jones & Laughlin's, Limited, and Laughlin & Company, Limited. This merger brought about a total "J & L" annual capacity of 1,000,000 tons of iron and 1,000,000 tons of steel. The works were at Pittsburgh on opposite sides of the river Monongahela. The company's Aliquippa Works is among those to be visited by Iron and Steel Institute members attending the special meeting in the US and Canada.

IN 1905, land was acquired at Woodlawn, Pa., about 20 miles down river from the Pittsburgh plant and building started in 1907. The first blast furnace was completed in 1909, another two in 1910, a fourth in 1912, and a fifth in 1920. Steelmaking and rolling plant were started in 1909 and tinplate was first rolled in 1910. Open-hearth steel was first produced in 1912 and Bessemer steel in 1914. In 1912 the annual ingot capacity was 250,000 tons and this had grown to 1,420,000 tons by 1930. Products were principally billets, merchant bars and shapes, welded pipe, tinplate, and wire. Seamless tube production started in 1927.

Since the last war the following addition and replacement plant have been installed:—A continuous strip pickling and cold-reducing line for tinplate production; a rod mill (replacing two old mills); coke ovens; blooming mill (rebuilt and electrified); semi-continuous hot-strip mill; basic oxygen steel plant; mills for electric weld and continuous buttweld pipe.

Today, the Aliquippa Works occupies a site of 475 acres extending for about five miles between the left bank of the Ohio river and the Pittsburgh and Lake Erie railway, thus having excellent rail and river transport facilities. It has annual capacities for 1,935,000 tons of by-product coke, 2,090,000 tons of iron, 1,164,000 tons of open-hearth steel, 384,000 tons of Bessemer steel, and 880,000 tons of basic oxygen steel. Its products include strip bars, rods, structurals, skelp, tube rounds, hot- and cold-rolled sheet, black plate electrolytic tinplate, hot-dip tinplate, wire, woven wire fence, continuous buttweld and electric weld

SINTER LINE PRODUCING MONTHLY 225,000 TONS OF HIGH-QUALITY SINTER FOR THE BLAST FURNACES AT THE ALIQUIPPA WORKS.

pipe, seamless tube, galvanized pipe, and mechanical tubing.

Raw Materials

Iron ore comes principally from company-owned properties on the Mesabi range in Minnesota and the Marquette range in Michigan, and the Benson mines in New York. Some Mesabi ore is also purchased. The Lake ores are shipped by carriers to lower lake ports and transferred into railway hopper cars for shipment to the plant. The New York ore is beneficiated and sintered at the mine and shipped by rail throughout the year. It is a Bessemer magnetite grade. Analyses of the ores and sinters used at Aliquippa are given in Table 1.

With full operations, the Aliquippa Works uses about 3,600,000 tons of iron ore and sinter per year, of which some 80 per cent. comes from the Lakes ranges.

Some limestone is quarried at a company-owned property at Martinsburg, West Va., and some is purchased from quarries in Pa. Dolomitic stone comes from company-owned quarries at Millville, West Va. About 2,300 tons of limestone are used per day at Aliquippa.

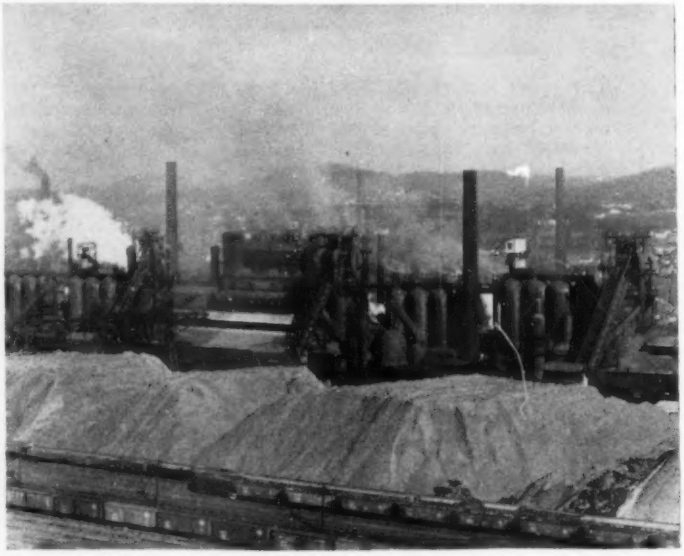
High-volatile coal comes from company-owned mines in southwestern Pa., while low-volatile coal is purchased from mines in Southern West Virginia. The coals are washed at the mines, and come to the plant by river barge.

Normal coal consumption at Aliquippa is about 8,575 tons of coking coal and 1,200 tons of boiler coal per day.

Coke Plant

Coking plant consist of four batteries of by-product ovens arranged in a single row. Nos. 1, 3, and 4 batteries are of modern underjet design with ovens 15¼ to 18¾ in. wide, 40 ft. 5½ in. long, and 13 ft. high. Each oven takes a normal charge of 17.25 tons of coal. Nos. 1 and 4 batteries each has 106 ovens, while No. 3 consists of 59 ovens. No. 2 battery is composed of 81 ovens of gun-flue design with top crossovers, each being 15 to 17 in. wide by 40 ft. 8 in. long by 14 ft. high. Each of these ovens takes a normal charge of 18 tons of coal. All batteries are underfired with coke-oven gas, using 40 to 42 per cent. of the gas produced.

With full operations, coking time is 17 hr., giving about 6,000 tons of furnace and nut coke and 360 tons of coke breeze.



THREE OF THE FIVE BLAST FURNACES AT THE ALIQUIPPA WORKS.

TABLE 1.—*Iron-ore Analyses (Natural Basis).*

	Minnesota.		Michigan basic.	New York Bessemer.	Aliquippa sinter.	Canadian pellets.
	Basic.	Bessemer.				
Fe	54.01	55.26	52.53	64.04	54.89	64.35
SiO_2	8.31	10.74	7.10	5.44	9.75	2.06
P	0.057	0.036	0.075	0.023	0.043	0.005
Mn	0.38	0.34	0.28	0.26	0.20	0.08
Al_2O_3	1.16	0.69	2.47	2.78	1.52	0.48
CaO	0.08	0.09	0.66	0.23	4.50	0.35
MgO	0.07	0.07	0.97	0.26	1.79	1.21
S	—	—	0.31	0.03	0.021	—
H_2O	7.86	5.37	10.94	7.60	3.15	3.23

Modern equipment is provided for the recovery of the usual by-products of coal carbonization.

Ironmaking

Five blast furnaces, three of 28 ft. 6 in. dia. one of 27 ft. dia., and one of 26 ft. 6 in., provide a total ironmaking capacity of 2,090,000 net tons per year. The five furnaces are similar in design. Design and operating data of one of them (No. 5) are given in Table 2. No. 5 furnace is said to be the first in the United States to average more than 1,000 tons of iron a day for an entire year. This was in 1928.

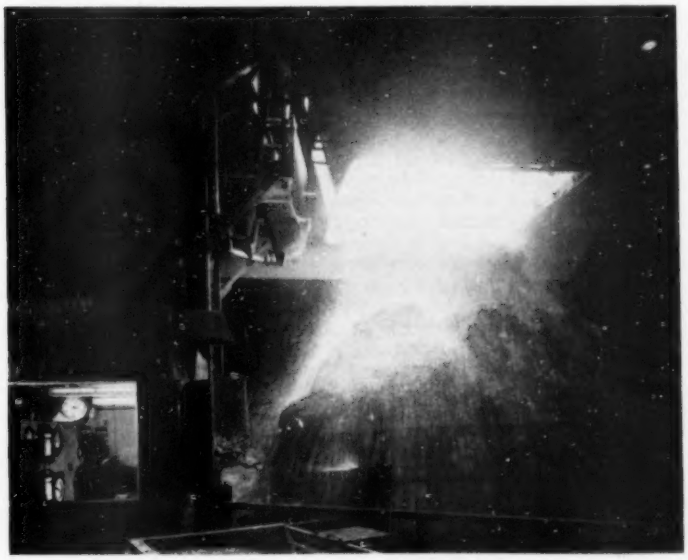
Blowing equipment for the furnaces is comprised of two turboblowers rated at 100,000-cu. ft./min.; 30-lb./sq. in. pressure; one turboblower rated at 60,000-cu. ft./min., 30-lb./sq. in.; one turboblower rated at 45,000-cu. ft./min., 30-lb./sq. in., and 10 double vertical blowing engines with 84 by 60-in. air tubs, each capable of delivering a maximum of 30,000 cu. ft./min.

Stack temperature of the stoves averages about 180 deg. C. Blast temperatures average 580 deg. C., but may be increased to about 680 deg. C., at times, and blast pressure, 15 to 18 lb./sq. in. Blast temperatures are automatically controlled by mixer valves on all furnaces.

In 1960 a new travelling grate sinter machine, believed to be the largest in the world, came into production. This machine has pallets 13 ft. 2 in. wide, and is 183 ft. 9 in. long over the 14 divided windboxes. The total grate area of 2,419 sq. ft.

TABLE 2.—*Details of No. 5 Blast Furnace.*

Dia. of hearth, ft.-in.	26 6
Dia. of bosh, ft. in.	28 9
Dia. of stockline, ft. in.	19 0
Height, iron notch to stockline, ft. in.	74 3
Height of crucible, ft. in.	10 6½
Heigh of bosh, ft. in.	12 7½
Height of straight section, ft. in.	5 2½
Working volume, tuyeres to stockline, cu. ft.	31,520
No. of tuyeres	18
Tuyere dia., in.	7
Lining thickness, crucible in.	45
Lining thickness, bosh in.	31½
Lining thickness stack, in.	36 to 67½
Lining thickness, throat, in.	13½ to 34½
Big bell dia., ft. in.	14 0
Big bell angle, deg.	55
No. of stoves	4
Blast volume, average, cu. ft./min.	80,000
Blast volume, maximum, cu. ft./min.	83,000
Daily iron production, average, net tons	1,255
Daily iron production, maximum, net tons	1,350



A "BLOW" AT THE BASIC OXYGEN FURNACES.

and capacity is 6,500 tons of self-fluxing sinter per day.

Recently a new type of sinter cooler has been installed. In this the sinter is cooled by blasts of air as it works its way down a vertical shaft, the cooling exposure period being 1½ hr. compared with 20 min. in the conventional-type rotating cooler. The cooler has a capacity of 3,800 ton/day.

Bessemer and low-manganese basic irons are produced in approximate proportions of 40 and 60 per cent., respectively. Normally, Nos. 1, 2, and 3 furnaces are on basic iron, Nos. 4 and 5 on Bessemer. Iron specifications (per cent.) are given in Table 3.

Each furnace makes five casts in 24 hr. into mixer type ladles of 190 tons capacity. Normally, no iron is pigged, although three double-strand pig machines of 140 ton/hr. total capacity are available. Slag from the fur-

TABLE 3.—*Iron Percentage Analyses*

	Bessemer iron.	Low-manganese basic iron.
Silicon	1.10–1.40	1.10–1.40
Sulphur	0.032 max.	0.035 max.
Phosphorus	0.085 max.	0.150 max.
Manganese	0.40–0.50	0.40–0.50

naces is about 900 lb. per ton of iron, depending on furnace practice. Part of the slag is processed by a commercial slag company, the balance being discarded in a slag fill.

Furnace practice shows the following average figures (lb. per net ton of iron produced):—Ore and sinter used, 3,475; limestone, 700; coke (adjusted to 3 per cent. moisture), 1,600; scrap charged, 200; roll scale charged, 90; slag produced, 900; flue dust produced, 150; furnace scrap produced, 19.

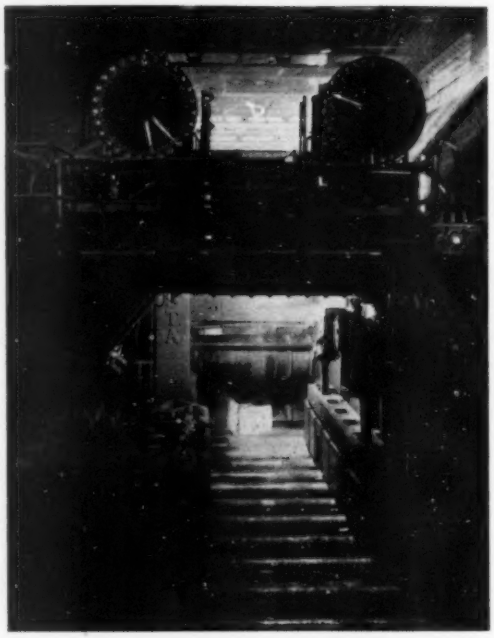
Steelmaking

Four different steelmaking processes are used at Aliquippa. New facilities are two basic oxygen furnaces, which, combined with three acid Bessemer converters and five open-hearth furnaces, provide a total capacity of 2,428,000 net tons of ingots per year. Of this, oxygen steel accounts for 880,000 tons, Bessemer steel for 384,000 tons, and open-hearth steel for 1,164,000 tons. The open-hearth product may be made either by the duplex process or the scrap and iron process.

The oxygen furnace shells, 17 ft. 8 in. dia., are made of 2-in. steel plate, with 1½-in. plate for the cone section. They are lined with burned magnesite brick against the steel plate, a rammed layer of tar-magnesia mix, and an inner lining of tar-bonded magnesite or dolomite brick. Lining thickness is 36 in. on the bottom, 26½ in. on the sidewalls, and 20½ in. in the cone section. The brick is laid as an inverted arch in the dished bottom, with keyed rings in the sidewalls and cone. Lining life averages over 200 heats.

A typical charge might be 130,000 lb. of molten iron and 50,000 lb. of steel scrap. Scrap is loaded by crane and magnet into a scrap-charging car with tilting box, which dumps the scrap into the tilted furnace. Hot metal comes from the blast furnaces in 190-ton mixer-type ladles, from which the desired amount of iron is poured into a charging ladle. An overhead crane tilts this ladle over the nose of the furnace and transfers the iron. Some iron-ore pellets or roll scale may then be added, as well as lime and perhaps some fluorspar.

A water-cooled oxygen lance with a 2.05-in. dia. nozzle is lowered to a predetermined position above the surface of the bath. Oxygen is turned on at about 175 lb./sq. in. pressure, with a flow of about 8,000 cu. ft./min. Progress of the blow is judged by observation and experience. The end of the process is marked by a clearly visible drop in the flame at the vessel nose. At this point, the lance is withdrawn and the furnace turned to a horizontal position to permit the skimming off of fluid slag into a slag pot below.



THE 44-IN. BLOOMING MILL AT THE ALIQUIPPA WORKS.

Control of the finishing temperature to within a narrow range is obtained by computing the weights of the materials of the charge and cooling additions according to heat-balance and slag and metal composition equations.

The furnace is then turned down in the opposite direction to pour the steel into a teeming ladle. While the blow is in progress, the nose of the furnace is immediately below a water-cooled hood, so that all dust and gas pass up into the hood through the action of large fans. The gases are sprayed with water to remove the heavier entrained particles and to lower the temperature from around 1,650 deg. C. to less than 250 deg. C. Electrostatic precipitators then remove the fine dust, allowing clear gas to pass up the stack. The blows usually last 20½ min. and heats run 81 to 83 tons. Tap-to-tap time averages 46.4 min. Production averages 105.5 ton/furnace hr. Oxygen consumption averages 1,960 cu. ft. per ton of ingots.

The oxygen is purchased from the manufacturing

TABLE 4.—*Percentage Analyses of Blown Metals.*

	Bessemer metal.	Basic blown metal.
Carbon	0.03–0.04	0.04–0.50
Manganese	0.03–0.04	0.03–0.04
Silicon	0.01 or less	0.01 or less
Phosphorus	0.065–0.075	0.12–0.18
Sulphur	0.04 max.	0.04 max.

VIEW FROM CONTROL CABIN OF ONE OF THE TWO CONTINUOUS WELD PIPE MILLS.

company which designed, built, and operates the two oxygen units, each capable of making 115 ton/day of 99.5 per cent. oxygen, as well as streams of high-purity nitrogen and argon.

Iron for the oxygen process contains 1.10 to 1.40 per cent. silicon, 0.35 to 0.50 per cent. manganese, 0.10 to 0.15 per cent. phosphorus, and 0.02 to 0.03 per cent. sulphur. Analyses of the steel produced in the basic oxygen furnaces range 0.03 to 0.95 per cent. in carbon, 0.20 to 1.50 per cent. in manganese, with phosphorus averaging 0.012 to 0.013 per cent and sulphur 0.02 per cent. Nitrogen content averages 0.003 per cent. Alloying additions are made to the teeming ladle. Deoxidizing additions are made either to the ladle or the moulds.

Flux consumption is 130 to 140 lb. of lime and about 0.9 lb. of fluorspar per ingot ton. About 0.9 lb. of roll scale is also used.

Steel is poured into a variety of bottle-top and open-top moulds, ranging from 22 by 24 in. up to 25 by 43 in. and 27 by 37 in. The steel is applied to the production of tinplate, welded pipe, light structurals, cold heading wire, and welding rods. About 72 per cent. of the basic oxygen ingot production is capped and keyed, 18 per cent. rimmed, and 10 per cent. killed steel.

The three acid-Bessemer converters are used to produce regular Besemer steels and to blow metal for duplexing in the open-hearth furnaces. Each converter takes a maximum charge of 62,000 lb. of molten iron to turn out 54,000 lb. of product.

The blown metals poured from the converters show percentage analyses as given in Table 4.

Bessemer steel production has been averaging about 27,000 net tons per month, of which about 82 per cent. is capped and keyed, 15 per cent. hot-topped, and 3 per cent. rimmed. In addition, about 67,000 tons of blown metal is produced per month for the open hearth.

Open-hearth steel is produced by the duplex process, by the scrap and hot metal process, or by a combination of the two. The original installation in 1912 consisted of four tilting furnaces, which are particularly adapted to the duplex process. In 1937 one additional furnace of stationary design was built. This furnace uses the scrap and hot metal process exclusively.

The four 150-ton tilting furnaces, built on 110-ft. centres, are 90 ft. long inside the buckstays by 22 ft. wide. Bath dimensions at the foreplate level are 44 to 50 ft. long by 18 ft. 7½ in. wide, giving hearth areas of 704 to 784 sq. ft. The 150-ton stationary furnace is 70 ft. 6 in. long by 23 ft. wide, with a bath 42 ft. long by 20 ft. wide, giving 728 sq. ft. area. Furnace bottoms are about 36 in. thick, built up of 4 in. of insulating material and 14 in. of brick, variously topped with burned magnesite or a ramming mix and burned magnesite. Furnace roofs are 15 in. thick with 18-in. ribs. Zebra courses of basic brick are used along the back skewbacks. Basic brick front walls are used in all furnaces, and basic brick panels are installed in the port ends. The stationary furnace has suspended basic ends. All furnaces have double regenerator chambers at each end. The smaller chamber is 7 ft. 9½ in. wide, the larger, 12 ft. 10 in. wide. Both are 21 ft. long, and contain checkerwork 10 ft. 6 in. to 15 ft. deep.

Oil is the principal fuel, but the two end furnaces also use some coke-oven gas and natural gas. For the entire shop, fuel consists of about 80 per cent. oil and 20 per cent. gas.

All of the furnaces have automatic reversal equipment, based on temperature differential. Also, all furnaces have roof temperature recorders, oil meters, fuel-air ratio controls, damper controls, and radiation pyrometers for bath temperature. Four of the furnaces are equipped with 28,000 cu. ft./min. forced draft fans.

Heats of 152 tons are tapped, with heat times averaging 3 hr. 48 min. for the duplex process and 9 hr. 56 min. for the scrap-hot metal process. Production rates are 40 and 15.54 ton/furnace hr., respectively, for the two processes, and fuel consumption 1,650,000 and 4,029,000 B.t.u. per ton of steel produced. The unusually wide variety of types and grades of steel made includes ordinary killed steels, fine grain steel, rimmed, and capped and keyed steel.

The production of these various grades of steel requires the use of fluxes, deoxidizers, and alloys averaging overall lb. per ton, as follows:—Burned lime, 59.17; limestone, 43.93; fluorspar, 2.88; roll scale, 54.35; ferro-silicon, 2.98; speigel, 4.13; Si-Ti-Al alloy, 1.54; ferro-manganese, 19.03; aluminium, 0.67.

Eight principal mould types are used:—22 by 24 in., 25 by 27 in., and 25 by 43 in. bottle tops, for capped and keyed, and silicon capped ingots; 24 by 24 in. open top or hot top, for rimmed, semi-killed, killed, and fine grain steel; 25 by 43 in., and 24 by 48 in. open top, for rimmed and semi-killed steel; 24½ by 24½ in. big-end-up, for killed and fine grain steel. Moulds are prepared for teeming by cooling them in water and spraying with powdered pitch and a commercial preparation.

On the tilting furnaces, slag is flushed from the front of the furnaces into cinder pots during the working of the heat, and some slag is flushed from the tapping spout while tapping the heat. On the stationary furnace, all slag is removed at the back of the furnace during the tap.

The open-hearth building is 651 ft. 8 in. long by 74 ft. 9 in. wide, and is served by three 50/15-ton cranes and three 10-ton charging machines. The pouring bay, of the same length, but 47 ft. 3 in. wide, is served by three 185/25-ton ladle cranes, and contains two pouring platforms. One platform is equipped for the production of leaded steel.

Due to the nature of steelmaking processes at Aliquippa, the plant actually uses less scrap than is made in the mills. Consequently, little storage space is provided for scrap. Some scrap is shipped to the company's other plants.

Blooming Mill

From the strippers, drags of ingots are moved to the soaking pits which are located in a building 518 ft. 3 in. long, served by three pit cranes of 68-ft. span. There are 11 rows of pits, providing a total of 39 pits with 4,937 sq. ft. of hearth area, 23 being of recuperative design and four of regenerative design.

Coke-oven gas can be used in all pits. In addition, one row of recuperative pits can use blast-furnace gas and the other six rows of recuperative pits can use a mixture of natural gas and air. Pit covers are operated either by hydraulic rams or by motor-driven pinion and rack. Normally, ingots are charged into the pits at temperature ranging 870 to 980 deg. C. after about 20 hours' track time. Heating time runs approximately five hours. Fuel consumption averages 700,000 B.t.u. per ton.

An ingot ready for rolling is drawn by pit crane and placed in an ingot buggy, which carries it to the mill table at speeds up to 1,700 ft./min. The approach table is 45 ft. long and contains a scale which records ingot weight.

The blooming mill, installed in 1953, is a 44-in. 2-high reversing unit, with cast-alloy steel rolls of 43 in. collar diameter and 90½ in. body length running in babbitted bearings. It is designed to roll square blooms ranging from 6 to 12⅝ in., and slabs 7⅞ to 42 in. wide by 5 to 9 in. thick. Blooms and slabs weigh from 9,000 to 20,000 lb.

The mill rolls at speeds up to 1,350 ft./min., and averages about 262.8 net ton/hr. The mill has rolled as much as 494 ton/hr., 2,722 ton/8-hr. turn, 7,002 ton/day, and 176,476 tons of blooming mill product per month.

AN INSPECTION POINT AT THE ELECTRIC WELD MILL.

Bar and Billet Mills

The 21/18-in. bar and skelp mill is a two-high continuous mill with a roughing train of four 21-in. stands and two 18-in. stands, and, following a looping pit, a finishing train of six 18-in. stands and two vertical edgers. All horizontal stands use adjustable side-guard entry guides, and top and bottom stripper type delivery guides.

Each train is driven through gearing and pinions by a 5,750-h.p., 92.5-r.p.m., 6,900-volt, 25-cycle induction motor. Stand spacing and speeds are as shown in Table 5. The mill has a maximum delivery speed of 585 ft./min.

The mill takes blooms, direct from the blooming mill, ranging 7⅞ to 15 in. wide by 4 to 8¼ in. thick, and reduces them to slab billets 7¼ to 15 in. wide by 1⅞ to 4¼ in. thick, or to skelp of 9¼ to 15⅜ width and 0.196 to 0.304 in. thickness. These products are finished out of various stands of

TABLE 5.—*Bar-skelp and Billet Mills.*

Stand.	Roll size, in.		Distance from preceding stand, ft. in.	Roll, r.p.m.
	Maximum dia.	Body.		
21-18-in. Bar and Skelp Mill.				
No. 1 ..	18½	25	—	9.16
No. 2 ..	19⅛	25	10 3⅛	11.0
No. 3 ..	20⅛	25	9 3	12.52
No. 4 ..	20⅛	25	10 3½	16.49
No. 5 ..	17⅜	20	10 2⅛	23.9
No. 6 ..	17⅜	20	10 0	31.2
Edger ..	11	—	20 9.21	38.58
No. 7 ..	17⅛	20	4 8.79	36.04
No. 8 ..	18½	20	10 0	44.8
Edger ..	12½	—	4 8.285	73.32
No. 9 ..	17⅛	20	10 3.715	61.66
No. 10 ..	18⅛	20	10 0	76.49
No. 11 ..	18½	20	10 0	102.34
No. 12 ..	18½	20	10 0	123.34
21-18-in. Billet Mill.				
No. 1 ..	21½	48	—	15.081
No. 2 ..	21⅜	48	12 7	18.074
No. 3 ..	21½	48	12 0	20.676
No. 4 ..	21½	48	12 0	27.407
No. 5 ..	21½	48	12 0	32.435
No. 6 ..	21½	48	11 0	43.082
Edger ..	12½	—	195 3.21	38.576
No. 1 ..	19	27	4 8.79	36.039
No. 2 ..	19⅛	27	10 0	44.804
No. 3 ..	19	27	10 0	61.666
No. 4 ..	20	27	10 0	76.490
No. 5 ..	19½	27	10 0	102.340
No. 6 ..	20	27	10 0	123.333

the mill, as best fits the rolling schedule. Products go principally to the 14-in. merchant mill or to direct shipment. This mill has a rated capacity of 40,000 ton/month, but it is rarely operated at capacity. Its production depends on the distribution of steel from the blooming mill.

The billet mill, which parallels, the bar-skelp mill at a distance of about 35 ft., is also a 2-high continuous unit consisting of six 21-in. roughing stands and, about 200 ft. away, six 18-in. finishing stands preceded by a vertical edger.

Each train is driven through gearing and pinions by a 5,750-h.p., 92.5-r.p.m. motor duplicating those on the bar-skelp mill. The finishing train motor also drives a crop shear preceding the train, as well as the vertical edger. Mill speeds, and stand spacing are given in Table 5. The mill has a maximum delivery speed of about 575 ft./min.

The billet mill receives 7⅝ to 8¼-in. square blooms from the 44-in. mill, and reduces them to billets ranging from 1¼ in. squares up to 6¼ by 6¼ in. Billets smaller than 4 in. square are finished in the 18-in. train and sheared to length on a steam-operated flying shear. Billets 4 in. square or larger are finished in the 21-in. train, sheared on a 42-sq. in. capacity up-cut shear, and dummied through the 18-in. train. The billet mill has a rated capacity of 80,000 net ton/month.

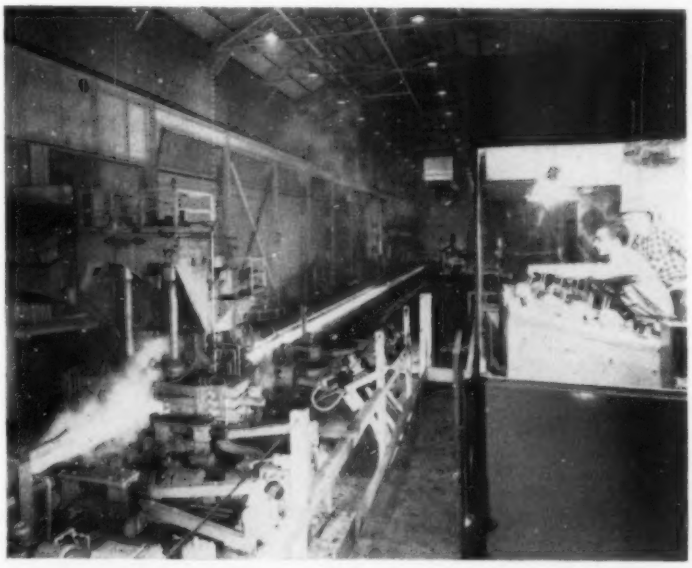
Merchant Mill

The Aliquippa 14-in. merchant mill was erected in 1924 to the company's own design, primarily to produce junior beams, but also capable of rolling angles, channels, flats, etc.

The mill is a straight-away continuous mill of 12 stands, with a "thirteenth" stand replacing No. 12 when junior beams are being rolled. The first three stands, which are driven through gearing by one motor, are 16-in. roughers. Stands Nos. 4, 8, and 10 are bottom-driven vertical edgers. The remaining stands, individually driven, are 14-in. units, but in some cases, 16-in. pinions and larger rolls are used on Nos. 9 and 12 stands. It is planned to change to 18-in. pinions on the first three stands and 16-in. pinions on the other stands in the future, as this mill is called on to roll some oversize sections.

Scale is removed from the steel by hydraulic sprays at Nos. 1, 2, and 3 stands. Water at 1,000 lb./sq. in. pressure is supplied by a motor-driven 1,000 gal./min. centrifugal pump.

The 14-in. mill takes billets 2$\frac{1}{32}$ to 15 in. in width and 2$\frac{1}{32}$ to 4 in. in thickness. It rolls 6, 7, 8, 10, and 12-in. junior beams, 10 and 12-in. junior channels, 10 and 12-in. joist beams, 14-in. light beams, and 3, 4, 5, 6, and 8-in. standard channels. Flat-rolled material is produced ranging 1½ to 15 in. wide and $\frac{7}{16}$ in. to 2 in. thick, with the limitations of thickness being not greater than half of the width and in the lighter gauges of



REVERSING ROUGHER ON HOT-STRIP MILL. IT IS OPERATED BY AUTOMATIC PUNCH CARD CONTROL.

$\frac{3}{16}$ to $\frac{1}{16}$ in., the minimum width is 2 in. Angles are rolled in open passes in sizes of $1\frac{1}{2}$ to 6 in. in equal leg sections and from 2 by $1\frac{1}{4}$ in. up to 6 by 4 in. in unequal leg sections. Some special sections are also rolled, including rim sections and cutter bar.

Rolling rates average 40 ton/hr., with records of 735 tons in an 8-hr. turn and 31,978 tons in one month.

10-in. Skelp Mill

Skelp for the production of welded pipe comes from the 18-in. mill previously described, and from a 10-in. skelp mill, designed to roll billets ranging $2\frac{5}{16}$ to $7\frac{7}{8}$ in. in width and $2\frac{1}{4}$ to $2\frac{5}{16}$ in. in thickness into skelp $2\frac{5}{8}$ to $7\frac{3}{4}$ in. wide and 0.10 to 0.25 thick. The 10-in. mill also produces some strip. The mill is a continuous train made up of five 12-in. stands, three 10-in. stands, and three vertical edgers. A looping pit is provided before and after the second edger.

The 10-in. skelp mill has a rated capacity of 25,000 ton/month, but has rolled as much as 555 tons in an 8-hr. turn, 1,503 tons in one day and 34,352 tons in a month. The average rate is 41 ton/hr.

Continuous Weld Pipe Mills

Another part of Aliquippa's modernization programme are two continuous butt-weld pipe mills producing a size range of $\frac{1}{2}$ to 4-in. nominal diameters.

No. 1 mill, which began operation in 1957, has a size range of $\frac{1}{2}$ to 2 in. It is of conventional layout, with coil payoff, leveller, shear, flash welder, pinch roll, and magnet roll units feeding the skelp into a continuous recuperative heating furnace. The mill consists of a forming pass, a welding pass and 12 reducing stands on 24-in. centres. Rolls are of $10\frac{1}{2}$ in. nominal diameter by $6\frac{1}{4}$ in. roll body length.

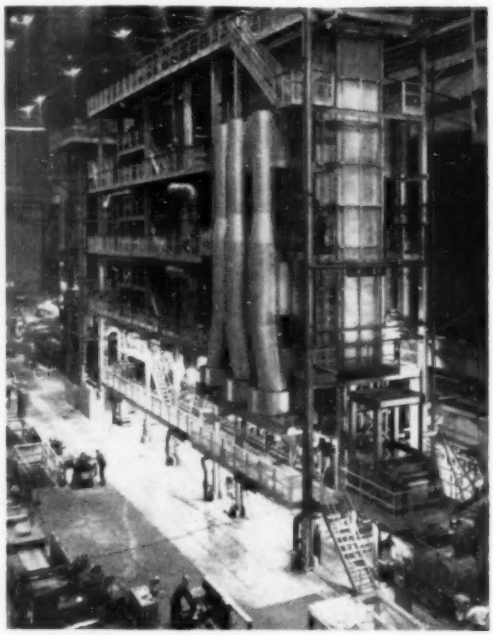
In the first, or forming, stand, skelp is bent into an approximate horseshoe shape with the opening down. A welding horn located immediately after this stand has a lip which enters the opening of the bent shape to prevent twisting. The tip of the horn is drilled to permit jets of air or oxygen to impinge on the edges of the skelp.

The actual welding takes place in No. 2 stand, where rolls bring the skelp edges together under pressure. The remaining stands of the mill reduce the diameter of the pipe.

Skelp for No. 1 mill runs from $6\frac{5}{8}$ to 13 in. in width and 0.102 to 0.24 in. in thickness. Coil weights range from 1,500 to 8,600 lb. Production rates vary with the pipe size being produced. The actual average is 31.6 ton/hr., but records have been set at 448 tons in an 8-hr. turn and 1,165 tons in one day. Power consumption averages 27.8 kWh./ton, including mill drives and auxiliaries.

No. 2 mill, started up in 1958, is similar to No. 1 in principle, but has a size range of $1\frac{1}{4}$ to 4 in. pipe. It uses skelp $12\frac{5}{8}$ to $17\frac{1}{2}$ in. wide and 0.121 to 0.359 in. thick, in coils weighing 2,800 to 11,600 lb.

No. 1 mill was designed for a monthly tonnage of 20,600 tons, No. 2 for 27,520 tons.



THIS CONTINUOUS ANNEALING LINE CAN OPERATE AT SPEEDS UP TO 2,000 FT./MIN.

Electricweld Pipe Mill

The electric resistance weld pipe mill was designed to produce pipe of $4\frac{1}{2}$ to $12\frac{3}{4}$ in. outside diameters from coiled skelp at speeds up to 150 f.p.m. Skelp ranges $14\frac{1}{2}$ to $40\frac{1}{2}$ in. in width and 0.237 to 0.330 in. in thickness. This mill has a record month of 17,116 tons of pipe.

Seamless Tube Department

The seamless tube department consists of a steel conditioning area, a 30-in. round mill, two tube mills, and facilities for finishing and shipping tubes and for producing couplings. The 30-in. mill produces rounds of 5 to 10 in. dia. for No. 1 tube mill, and $3\frac{1}{2}$ to 6 in. dia. for No. 2 tube mill. An average rolling rate of 66.9 net tons/hr. is maintained, but records of 939 ton/8-hr. turn, 2,459 ton/day, and 51,800 ton/month have been made.

No. 1 seamless tube mill has a size range of $5\frac{1}{2}$ to $14\frac{3}{8}$ in. dia. tubes, in lengths of 22 to 46 ft. The mill is a high-production unit and often rolls 18 to 20 miles of line pipe per day. Tonnage-wise, this mill turned out as much as 2,012 tons in a day and 34,592 tons in a month.

No. 2 seamless tube mill produces tubes of $2\frac{3}{8}$ to 6 in. outside diameter in 22- to 44-ft. lengths. It differs somewhat from No. 1 mill. Because of the smaller sizes, only one piercing unit is installed.

Its tonnage is about half of that of No. 1,

records having been set at 996 tons in a day and 19,337 tons in a month.

Rod and Wire Mill

To supply rod for the production of wire, a new three-strand rod mill was installed in 1951, replacing two old mills. This mill is currently producing rods from $\frac{7}{32}$ to $\frac{3}{8}$ in. inclusive, but this range can be increased to $1\frac{1}{8}$ in. if desired. All sizes may be triple-stranded.

The new mill is supplied with $2\frac{1}{2}$-in. square billets, 30 ft. long, from the billet mill. The roughing train consists of eight stands (two 16-in., six 15-in.) in line. The intermediate train is made up of eight 12-in. stands, four of which are in line with the roughing train, while the other four are placed in two pairs. Repeaters reverse the flow of the steel after stand No. 12 and after stand No. 14. A third repeater after stand No. 16 leads the steel back into the finishing train, which consists of six stands, two of 10.063-in. pitch dia., two of 10.5 in., and two of 11 in.

The mill averages about 45 net tons per gross operating hour, but has produced as much as 85 tons in one hour, 562 tons in an 8-hr. turn, 1,457 tons in a day, and 31,387 tons in a month.

In the wire mill, hot rolled rod is processed into a full range of wire sizes (from 0.007 to 1.0 in.) and grades. Rods are first pickled to remove scale from the hot rolling, then given a lime coating and baked. Cold drawing is performed on 13 individually driven single spindle blocks, 72 group-driven frame-type blocks, 39 continuous multiple spindle machines with four or less spindles, 43 continuous machines with five or more spindles, and 18 continuous wet-drawing machines. This drawing equipment can produce material running from 0.006-in. dia. up to 1-in. dia. To meet desired physical characteristics and finish, an extensive layout of auxiliary processing equipment is provided.

Strip Mill

A major unit in the Aliquippa modernization project is a 44-in. semi-continuous hot-strip mill, designed to produce hot-rolled bands $9\frac{1}{2}$ to $41\frac{1}{2}$ in. in width and 0.048 to 0.375 in. in thickness. The mill is located in a building 62 ft. wide by 936 ft. long, adjacent to the blooming mill, from which slabs are brought to the slab yard over a system of transfers.

Slabs coming to the mill range $12\frac{1}{2}$ to $40\frac{3}{4}$ in. in width, $5\frac{1}{2}$ to 9 in. in thickness, 99 to 290 in. in length, and 4,300 to 24,000 lb. in weight.

There are two continuous slab-heating furnaces, each rated at 150 ton/hr. They are 86 ft. long overall and have hearths 68 ft. long by 26 ft. wide. They are fired with coke-oven gas or natural gas. Fuel consumption averages 1,650,000 B.t.u. per ton.

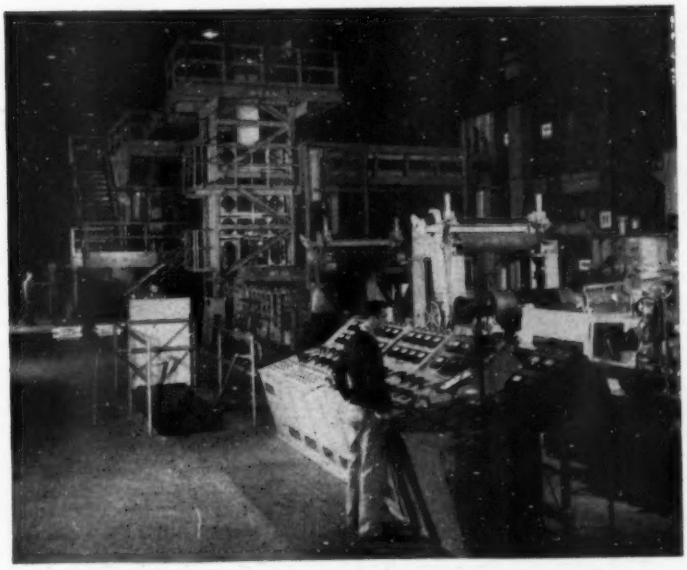
The first stand of the mill is a vertical edger with rolls 40 in. dia. by $13\frac{1}{4}$ in. body length. The edger is capable of taking heavy edging drafts and is very effective in cracking scale from the slab.

The second stand is a universal reversing rougher, placed about 30 ft. from the edger. This is a two-high 44 by 44-in. unit with babbitted bearings on the roll necks. Maximum roll opening is 14 in. and a maximum screw travel speed of 96.5 in./min. is available. Rolling speeds range 115 to 1,150 ft./min.

The roughing stand also has vertical edging rolls set 6 ft. ahead of the horizontal rolls. The vertical rolls are 24 in. dia., with a body length of $17\frac{1}{2}$ in.

The reversing rougher can be operated under completely automatic control by a card-programmed system, whereby punched cards are prepared with a complete rolling schedule on each. A card is made for each slab size, strip size, and grade of steel, using the drafts and speeds deemed best. Roll opening can be adjusted in $\frac{1}{32}$ in. increments from zero to 14 in. Integral edger roll openings can be adjusted to $\frac{1}{16}$ in. increments from 6 to 44 in. Mill speeds may be set at 115, 300, 440, 715, 880, or 1,100 ft./min. Edger speed is automatically adjusted to match main roll speed, with due allowance for the draft in the horizontal rolls.

A radiation detector which responds to the hot strip on the mill table is located on each side of the mill. They initiate the slowdown when the tail end of



DELIVERY END OF ONE OF THREE ELECTROLYTIC TINNING LINES.

the strip approaches the mill. As soon as strip leaves the mill rolls, load detectors initiate action to re-position rolls and re-enter the steel in the mill. Edging stand adjustments are also controlled by the system.

Under automatic operation, a punched card corresponding to the desired rolling schedule is inserted in the card reader. Pressing the "schedule advance" button causes data from the card to be transferred to the programming equipment. Pressing the "pass advance" button sets the mill for the first pass. After the slab is introduced to the mill, settings for each successive pass proceed automatically. The schedule will be repeated for each slab until the "schedule advance" button causes the schedule on the next card in the card reader to be set up. The rougher can be scheduled for a maximum of nine passes.

Leaving the rougher, the steel passes over a delay table composed of rollers 14 in. dia. by 4 ft. long on 36-in. centres. Each roll is driven by a 7½-h.p. d.c. motor under adjustable voltage control.

The first unit of the finishing train, a vertical edger, is located 247 ft. 11 in. from the roughing stand. It has rolls 24/26 in. dia., of 9-in. body length, running in roller bearings. They are driven by two 150-h.p., 250-volt, 460/920-r.p.m. d.c. motors. A gear ratio of 14.9 gives roll speeds of 30.8/61.6 r.p.m. or about 200/400 ft./min. surface speed. Edger roll adjustments are made by two 15-h.p. motors. A distance of 8 ft. 3 in. separates this edger from the first finisher.

The six finishing stands are all 22½ in. and 44 by 45 in. 4-high units, with roller bearings on the work rolls and oil-film bearings on the back-ups. They are spaced on 18-ft. centres.

Two more separate vertical edgers are built into the finishing train, one between No. 3 and No. 4 finishers, and one between No. 5 and No. 6 finishers. These units have rolls 14 to 16 in. dia. by 6½ in. barrel length. The three edgers on the finishing train are primarily for rolling bevel-edged material for pipe production.

Leaving the finishing train, strip proceeds over a runout table to two driven-mandrel type down-coilers about 310 ft. away, capable of forming strip 9½ in. to 41½ in. wide and 0.048 in. to 0.375 in. thick into coils of 23 to 24½ in. inside diameter, 60-in. outside diameter, with a maximum weight of 650 lb./in. of width.

Tin Mill

The tin mill at Aliquippa was modernized and expanded in 1947. It now occupies about 20 acres toward the south end of the plant and has an annual rated capacity of 600,000 net tons. Hot rolled coils, averaging 15,000 lb. in weight, come from the 44-in. hot strip mill. They are first cleaned of all hot-mill scale by pickling in a continuous line rated at 59,000 ton/month.

There are four pickling tanks 80 ft. long by 6 ft. 4 in. wide by 5 ft. 4 in. deep, constructed of rubber covered steel plate and lined with 10 in. of brick set in acid resistant cement. Each tank holds about 19,000 gal. of solution containing, in the various tanks, 10 to 18 per cent. sulphuric acid. These tanks are covered and vented to a fume disposal system. The pickling solutions are held at 95 to 100 deg. C. by the injection of steam. Immediately after the acid tanks are a cold-water rinse tank and a hot-water rinse tank, followed by a dryer, an edge trimmer, an oiler, and a recoiling reel.

Next comes the cold-reduction process, which is carried out in a 5-stand, 4-high, 21½ in. and 53 in. by 42 in. tandem mill. This mill is of unusually heavy construction. Roller bearings are applied to all work roll necks, with oil-flooded bearings of 3,000,000 lb. capacity each on the back-up roll necks.

The tandem mill takes hot-rolled, pickled strip 0.075 to 0.100 in. thick up to 38 in. wide and reduces it to a minimum gauge of 0.0072 in. It has a monthly capacity of about 53,600 tons, and is capable of delivery speeds up to 6,000 ft./min., although normal operation is of the order of 4,500 ft./min.

As a guide in tension control, an indicating tensiometer is located between each pair of stands. Strip gauge is maintained by reference to an X-ray gauge following the last stand.

After cold rolling, coils are moved by industrial truck to three electrolytic cleaning lines where the oil from the cold-rolling process is removed in an electrolytic caustic tank. One of these lines operates at speeds up to 2,200 ft./min.; the other two at 1,800 ft./min.

The 52-in. dia. coils formed at the cleaning lines are up-ended, weighed, and taken to the annealing department. Here are 13 rectangular portable annealing covers 21 ft. long by 13 ft. 10 in. wide by 8 ft. 5 in. high and five cylindrical covers 10 ft. 7⅝ in. outside diameter by 14 ft. 10½ in. high. All furnaces are fired with coke-oven gas. A deoxidizing atmosphere, supplied by four gas-preparation machines, is maintained within the inner covers.

Annealing facilities have been expanded recently by the addition of a continuous annealing line, 330 ft. long overall, designed to operate at speeds up to 2,000 ft./min.

The annealing line handles strip up to 38½ in. wide in coils of 85 in. maximum outside diameter, 50,000 lb. maximum weight. At maximum speed, it will process 30 tons of strip/hr.

An electronic computor is provided to accumulate data on strip gauge, temperature, speed, etc. Ultimately, the computor will be used to regulate temperature and speed.

Tinning is performed either by electroplating or by hot dipping. There are three electrolytic lines, two of the halogen type and one alkaline (presently being converted to halogen) capable of putting on coating weights of 0.10 to 1.00 lb. per base box. The largest of these lines is 470 ft. long overall and operates at speeds up to 1,740 ft./min.

The two sides of the strip may, if desired, be coated with different coating weights.

The line now being converted is being installed with 12 plating cells, 120,000-amp. plating current and a 2,400-kW induction reflow unit. It will operate at 1,800 ft./min. on 0.25-lb. coating. X-ray gauges, designed and developed by J & L, are installed on all three electrolytic lines to provide a continuous, accurate check on tin-coating thickness.

Total capacity of the electrolytic tinning lines is approximately 45,300 ton/month, with about 75 per cent. having a coating weight of 0.25 lb./base box and the balance 0.50 lb., 0.75 lb., 1.00 lb., and 1.00/0.25 lb. differential lb. coatings.

Metallurgical Control

Quality control from raw materials to finished product is a primary obligation of the metallurgical department. The Aliquippa metallurgical department is organized in four principal divisions serving the major production areas of the plant—steelworks, tubular products, flat-rolled products, and rod and wire products. The steelworks division is responsible for checking and enforcing quality requirements at the blast furnaces, basic oxygen, Bessemer, open-hearth, and blooming, bar, billet, skelp, and merchant mills.

The tubular products division is responsible for establishing and maintaining the quality standards of those products made in the seamless, continuous weld, and electric weld pipe mills.

The flat-rolled products division covers those products made on the hot-strip mill and tin mill.

The wire products division is organized along the same general lines as the tin mill, with laboratory, inspection, observation, and investigational groups. Rod and wire products are tested in accordance with their end use, and a constant check is maintained on cleaning and coating compounds and solutions.

Utilities

With full operations, Aliquippa Works uses about 75,000,000 kWh. of electric power per month. About one fifth of this is generated at 25 cycles in the plant, and the balance is purchased at 60 cycles from the public utility system. Power is generated in the north and south power houses, which are about two miles apart, but tied together by two transmission lines. In the south power house are two turbo-generators, one rated at 17,000 kW driven by a 12-stage turbine and the other at 10,000 kW driven by a 10-stage turbine. The north power house contains one 20,000-kW, 6,900-volt unit, driven by a 14-stage, 1,500-r.p.m. turbine operating on 435-lb./sq. in. steam, with a steam rate of 10.5 lb. per kWh.

Distribution of 25-cycle power is entirely by overhead open wire, while 60-cycle power is carried principally by overhead and underground cable. The 69,000-volt lines, however, are open wire.

Steam for the Aliquippa plant is generated in three separate boiler plants, each serving the section of the works in which it is located. Altogether there are 56 boilers.

Water consumption of the Aliquippa plant averages 315,000,000 gal./day—more than 50,000 gal./ton of steel made. Water is pumped from the Ohio river at three pumping stations.

With full operations, monthly fuel requirements of the Aliquippa plant, over and above the coke-oven gas, blast-furnace gas, and coke breeze produced in the plant, consist approximately of 37,000 tons of steam coal, 1,600,000 gal. of heavy fuel oil, and 500,000,000 cu. ft. of natural gas. Natural gas to the extent of 400,000 cu. ft./hr., stabilized with air, can be introduced into the coke gas line as required. Also, natural gas may be used directly on certain furnaces as a stand-by fuel when desired.

Service Departments

To accommodate river barge shipments of products, a modern dock is located at the extreme south end of the plant.

All maintenance and a considerable portion of the construction work at Aliquippa are handled through an extensive shop system. There are five complete machine shops containing various sized lathes, planers, shapers, boring mills, milling machines, gear cutters, drill presses, slotters, grinders, etc. There is a forge and blacksmith shop, a tin shop, a carpenter shop, a paint shop and a pipe shop, all equipped to carry out their respective crafts as called for by maintenance and construction programmes.

Plate fabrication and welding, as well as most of the boiler repair work, is handled by the boiler-shop, and motor repair work is done by the electrical shop.

• *Acknowledgments are made to the Jones & Laughlin Steel Corporation and to the editor of the Iron and Steel Engineer for providing information and illustrations.*

Welding in Shipbuilding

AUTUMN meeting of the Institute of Welding will take the form of a joint symposium on "Welding in Shipbuilding." The meeting will be held in co-operation with the Royal Institution of Naval Architects, the Institute of Marine Engineers, the Institution of Engineers and Shipbuilders in Scotland, and the North East Coast Institution of Engineers and Shipbuilders. The sessions will be held at the Institute of Marine Engineers, Memorial Building, 76, Mark Lane, London, E.C.3.

The symposium will be in five sections, papers on design, materials, yards and construction, welding and cutting, and quality control being presented. A brochure giving full details is available from the Secretary, Institute of Welding, 54, Princes Gate, Exhibition Road, London, S.W.7. Enrolment closes on October 23.

THE GOVERNMENT OF INDIA is being urged by the Central Committee of the All-India Manufacturers' Organization to establish a medium-sized steel plant for the economic utilization of iron ore from Salem and lignite from Neyveli. The committee also wants the Government to establish steel rolling mills at five centres in Madras State.

ACCIDENTS AT MINES

SOME AVOIDABLE INSTANCES

BRIEF accounts based on receipts of HM Inspectors of Mines draw attention to some of the fatal accidents which might have been avoided during the half-year ended April 1.

On a Meco-Moore machine face in a thick seam a timberer was erecting a bar behind the machine when he was buried by a fall of roof coal and dirt. The fall displaced two newly completed sets of bars and was bounded on the goaf side by a well-defined slip running almost parallel to the face, by concealed slips running at right angles to the face and on the face side by an induced cutter break. Had temporary support been erected behind the machine this accident might have been avoided.

A shotfirer was fatally injured when he was struck by a compresed-air blasting shell which he had fired from a point 20 yd. away. The shell was ejected from a hole drilled parallel with the line of face in a corner left by the cutting machine at one end of the face. If the shotfirer had taken proper shelter the accident might not have occurred.

On a longwall advancing power-loading face a workman was using a hammer to withdraw a wood sprag set between the pre-cut face and the front member of a self-advancing hydraulic support unit. Immediately the sprag was released one end fell against a flight of the moving armoured chain conveyor and the other end rammed the man against a roof support. He sustained injuries from which he subsequently died. The accident might have been avoided if the workman had placed himself so that the chain was running away from and not towards him.

Crushed Against Steel Prop

A fitter was walking between an advancing longwall face and the front row of props when a length of slightly overhanging coal fell from a well-defined cleavage plane and dislodged the one front sprag which had been holding it. The fitter was fatally crushed against a steel prop. If sprags had been set at intervals not exceeding 5 ft. apart, as required by the Support Rules, the accident might have been avoided.

In a tailgate which was being enlarged where it passed through a downthrow fault a bar and sprag had been dislodged by the firing of four ripping shots and were not reset. A ripper drilling another shothole three quarters of an hour later was killed by a stone which fell from the face of the fault above his head, and which had previously been kept intact by the sprag. If the ripper had reset the supports before doing anything else, as instructed by the shotfirer, this accident would not have happened.

A rope changer was found lying injured alongside two leading trams of a journey of 20 trams being hauled by direct rope along a section of road containing a double track parting. The two trams had been derailed following a hold-fast of the haulage rope near the capel caused by fouling a crossing-end exposed by platelayers dismantling one set of rails of the double parting. The man died in hospital a few days later. Had a piece of "dead" rail been left in the crossing or other precautions taken to prevent the rope fouling the exposed end the accident might have been avoided.

A machineman changing the picks of the pre-cutting jib of a trepanner machine was caught by the revolving trepanner head during "inching" and sustained fatal injuries. It appears that the man omitted to lock the trepanner head out of gear before he started to change the picks.

An old level was being repaired by an experienced faceworker and, while he was kneeling to cut a hole to take one leg of the first steel arch girder to be set at a previously unsupported junction, a stone fell from the roof and hit him, inflicting fatal injuries. The accident might have been avoided if the roof and sides had been properly dressed and temporary supports set.

On a machine-cut conveyor face supported by corrugated steel bars and rigid steel props a waste-man who went a short distance beyond the last row of supports to get packing material, was caught by a fall of roof and killed. If a long-handled rake, which was provided, had been used, or if temporary supports had been set, this accident would not have happened.

At the waste edge of a machine-cut longwall face in a seam overlain by a normally strong clift roof, a repairer was extracting the last support on the rise side when he was buried by a fall of roof which collapsed over the supports. The support was proving difficult to extract with a Sylvester and the victim was foolishly standing at the waste edge and attempting to assist his partner who was operating the Sylvester by striking the roof bar with a sledge.

An empty materials trolley was being drawn by a pony along a level haulage road when the front end became derailed. While the driver was lifting the front end to re-rail it the pony bolted, pulling the trolley over the driver. He sustained injuries from which he died. Had the pony been detached before the driver attempted to re-rail the trolley the accident might have been avoided.

Research at Warren Spring Laboratory

REPORT of the Warren Spring Laboratory for 1960, published for the Department of Scientific and Industrial Research by the Stationery Office (3s., postage 4d.), covers the laboratory's first full year of operation. When the Council for Scientific and Industrial Research set up the Warren Spring Laboratory at Stevenage (Herts) in 1959 it aimed to provide a versatile laboratory for the benefit of industry and other Government departments, to carry out research which cannot be fitted into the programme of another research body. Sir Harry Jephcott, chairman of the Research Council and of the laboratory's Steering Committee, says that these research facilities are being used to an increasing extent.

He draws particular attention to the success of the Mineral Processing Division in attracting work on a repayment basis. In pointing out that much of the current repayment work for industry is short-term, he expresses the hope that this will lead to longer-term work. In the field of human sciences, the Steering Committee has agreed that, at least at first, work at Warren Spring should be mainly concentrated on ergonomics.

CANADIAN PRODUCTION OF MOLYBDENUM contained in molybdic oxide (MoO_3) and molybdenite (MoS_2) concentrates amounted to 758,507 lb., valued at $1,000,265, in 1960. The value was $59,669 greater than in 1959, when production was 748,566 lb.

DISCUSSION

Development and Proving at the CEE

DR. P. G. TAIGEL'S NACM CONFERENCE PAPER

Mr. H. E. Tyson, immediate past president, presided at the session of the annual conference of the National Association of Colliery Managers, held in Edinburgh in June, at which the paper by Dr. P. G. Taigel, chief proving engineer, Central Engineering Establishment, National Coal Board, was presented and discussed. The paper was published in our issue of August 25 (p. 395) and the discussion is reported below.

MR. W. DUNCAN voiced the thanks of the meeting to Dr. Taigel for his comprehensive description of the work of the establishment. Colliery managers must all realize the importance of the work, particularly bearing in mind the call for improved efficiency, with adequate safety measures.

He asked about the staff of the establishment; how many of them were men who had practical knowledge of the use of mining equipment? He also asked at what stage in the development of a machine manufacturers were brought in.

CEE Personnel

DR. TAIGEL said that Mr. R. F. Lansdown, director of the Central Engineering Establishment, was assisted by Mr. C. V. Moss (deputy director), a mechanical engineer who had served with Imperial Chemical Industries, Limited, at its Bellingham mine. The head of the coal-face equipment branch, Mr. Dawson, was co-inventor of the Dawson miller, and until recently a headquarters mechanization engineer. Mr. Hughes, head of the tunnelling branch, was formerly engineer-in-charge of the Cynheidre sinking, and was a mechanical engineer. Mr. McRae, another mining engineer, headed the project assessment branch, while Dr. Hirst, head of the coal preparation branch, was well known for his developments in coal-preparation plant. It would take too long to enumerate all the senior engineers at the CEE, but a fair proportion of them had come from the mining industry.

The stage at which manufacturers were brought in varied with the projects. The board was not setting out to manufacture mining equipment at Bretby, but to develop new ideas to the prototype stage and then to interest manufacturers to develop production models. In other cases, new ideas and developments of manufacturers, if of interest to the board, were taken up and perfected in collaboration.

MR. H. H. WILSON said that he had known Dr. Taigel for more than 30 years; he was one of the "backroom boys" who hid their light under a bushel. As president of the NACM, he had asked Dr. Taigel to write the paper because of the good work he had been doing with the SMRE and for the board over a long period of years. He doubted if the people working in the field knew how much valuable work was being done at Bretby. The board was to be congratulated on the way in which the establishment was growing. Mr. Wilson asked if the author had thought of ways whereby the channelling of information between the establishment and the coalfield, and *vice versa*, could be improved.

DR. TAIGEL said he appreciated the difficulty that people in the field very often knew very little about the work of research or development establishments; and the reverse would apply. But the CEE, although a headquarters organization, was stationed in the Midlands; those who were working there did get around, and information was coming in. He had gathered that Mr. Wilson was wondering whether there could be a more formal system of getting information into the field and sending information back from the field to the establishment. To achieve adequate communication he was sure was necessary. There were, of course, conferences of mining engineers, mechanization engineers, and so on, and representatives of the CEE attended them; so that from the conference angle there was adequate coverage. Whether or not all questions on development and safety were being adequately handled through formal channels he could not say.

DR. R. MCL. ARCHIBALD (medical service, Durham Division), speaking as a layman, said he had been very much impressed by what Dr. Taigel had told the conference about developments, because in the past he had been slightly appalled by the machines which men were expected to handle and to operate. He believed that in the last analysis the man must be the master of the machine, and he asked what was being done at Bretby to ensure, in a concrete fashion, that the machines which were designed and developed were adapted to the men who had to operate them. Did they have there day-to-day, week-to-week, or month-to-month

physiological advice, and did they take cognisance of the whole field of ergonomics on this very important problem?

DR. TAIGEL replied that they did go half way in that matter, but not the whole way. All the machines underwent extensive field trials, and many experimental machines were operated by CEE engineers, who did not remain silent when they felt they should draw attention to some feature or other of methods of operation. They reported faults in the design or the building of a machine—and, of course, machines in the experimental stage were far from right first time.

A member of the Scottish Branch said that when using electricity they had remote control; by pushing a button electrical equipment was energized. With compressed air blasting they were operating at pressures of up to 12,000 lb./sq. in.; surely some thought could be given to operating a lower pressure hose. Perhaps the main line could be operated at 700 lb./sq. in. and, through a valve, the pressure adjusted to that required at the face.

DR. TAIGEL said it was not possible to step up pressures by a valve, but he felt that it would be possible to operate a shell from the remote position. It would be rather troublesome mechanically, but it could be done pneumatically by a control unit with lower pressures. However, he could not see the advantage of so doing. It was a possibility, but it must be left to the management to put over the case for this.

On the proposal of MR. T. R. SAMSON (Scottish Branch), the meeting accorded Dr. Taigel a vote of thanks for his paper.

Weldmesh for Supporting Cables

WELDMESH is being used as trays for carrying cablework at several NCB collieries. Examples of these are at Mansfield Colliery, No. 3 Area, East Midlands Division, and at Cwm Colliery, South-Western Division. The two photographs show installations using Weldmesh (3 in. by 3 in. by 5 s.w.g.) galvanized after manufacture.

The illustration on the left shows part of the installation for the coal preparation plant at Mansfield Colliery. The photograph on the right shows the main cable tray in the service basement of the electric winder house at Cwm Colliery.

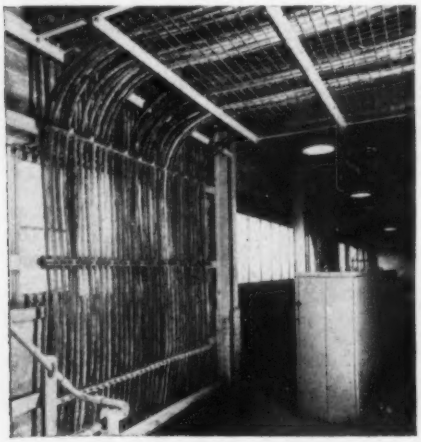
These installations were carried out by the Electrical Equipment Company (Leicester), Limited, to whom the Weldmesh was supplied by the manufacturers, the B.R.C. Engineering Company, Stafford. Photographs are by courtesy of the National Coal Board.

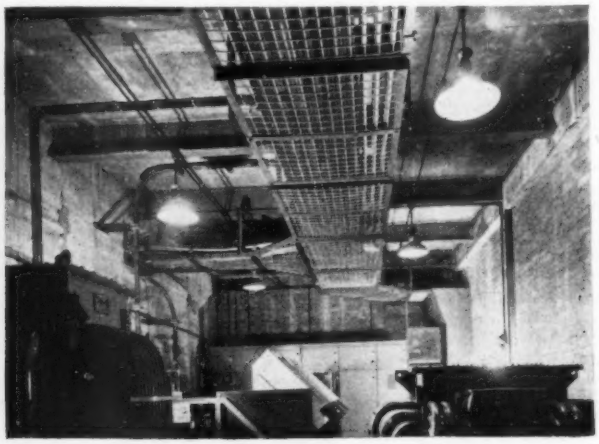
Measuring Stresses in Earth Strata

MR. A. H. WILSON, in collaboration with the National Coal Board's Mining Research Establishment, has invented a new device for measuring the stresses set up in earth strata.

The borehole plug comprises an element sensitive to variations in ambient stress. It has an axis about which at least three "active" gauges are arranged so as to be collectively sensitive to strain in any direction in the common plane. Each of the gauges is linked with a "compensating" gauge in isothermic relation with its "active" gauge. The electrical resistance strain of the "active" gauge varies according to the strain applied to it, which in operation responds to variations in the parameter being studied. The "compensating" gauge compensates for variations in the ambient temperature of the "active" gauge.

The element may comprise a cylinder (with the "active" gauges mounted on the internal wall) or a solid bar (in which case the "active" gauges are mounted on a transverse face of the bar).





INSTALLATIONS USING WELDMESH GALVANIZED AFTER MANUFACTURE.

New Literature

CATALOGUES, house magazines, booklets, and other publications received include those referred to below. Readers wishing to obtain a copy of any of the items should write direct to the address given, at the same time mentioning this journal.

FEDERATION OF BRITISH INDUSTRIES, 21, Tothill Street, London, S.W.1—Even in issues, such as the current number, when there is nothing directly "up our street," the FBI Review (2s. 6d.) is still well worth seeing. Many of the articles in the September edition are helpful and enlightening.

EFCO FURNACES, LIMITED, Queens Road, Weybridge (Surrey)—Author of "Fuel-fired Furnaces for Heating Prior to Hot Forming," in the August issue of the Efco Journal, is Kurt Genrich, of Efco Industrieofen, A.G., while the other main feature of the magazine is a continuation of H. Knight's article on "Production Heat Treatment by High-frequency Induction."

INSTITUTION OF WORKS MANAGERS, 196, Shaftesbury Avenue, London, W.C.2—Subjects covered in articles in the September number of Works Management (2s. 6d.) include industrial hygiene, pest control in industrial premises (with particular reference to the help given by the Pest Advisory Centres now operating in the main centres of industry), and first-aid and factory law.

HOULDSWORTH SCHOOL OF APPLIED SCIENCE, The University, Leeds 2—Report of Dr. A. L. Roberts, Livesey Professor of Coal, Gas, and Fuel Industries, and chairman of the Houldsworth School, for the academic year 1959-60, is now available. Dr. Roberts states that "the period under review may be regarded as one of consolidation, in which almost all the facilities planned for the Houldsworth School have been established." The research work in the various sections is detailed in the report.

LINCOLN ELECTRIC COMPANY, LIMITED, Welwyn Garden City (Herts)—Advantages of the CO_2-shielded arc welding of steel process are that it is semi-automatic, fast and easy to use, and the labour costs are approximately one third those of manual methods. A. A. Smith (British Welding Research Association) writes on the subject in the summer number of the Stabilizer, which also contains an article on "Modern Shipyard Welding," with particular reference to Smith's Dock Company, Limited, Middlesbrough.

BROOKE TOOL MANUFACTURING COMPANY, LIMITED, Warwick Road, Greet, Birmingham 11—The wide range of gear pumps manufactured by the company is the subject of a new 34-page illustrated brochure. Warwick pumps and the range of Brooke pumps are outlined in some detail, and attention is drawn to the considerable number of special pumps and of semi-standard pumps for special applications manufactured. The company, in fact, is always prepared to receive inquiries for requirements that are outside the provisions of the standard range.

CRAVEN ELECTRONICS, LIMITED, Victoria Works, Bingley (Yorks)—The company has issued a pamphlet describing its continuous electronic belt weigher, which automatically records the weight of material passing over a conveyor, this being presented on a counter in units of weight to suit customers' requirements. The equipment comprises three basic units:—A universal weigh idler set which can be fitted to any make or type of conveyor with minimum interference to existing plant; a tachometer generator and gearbox, and an integrating and totalizing unit housed in a robust cast alloy case.

W.G.I., LIMITED, Albion Ironworks, Miles Platting, Manchester 10—Since 1936 the company has supplied all the carbonizing plant which has been built at the St. Albans (Herts) works of the Eastern Gas Board. The summer number of West's Magazine describes an installation of 64 retorts, the third installation of Glover-West design at St. Albans. It is of particular interest in view of the increased emphasis now being placed on the production of smokeless fuels. News of other installations includes work at the Spencer Works of Richard Thomas & Baldwins, Limited, by West's Piling & Construction Company, Limited.

SHEFFIELD CHAMBER OF COMMERCE AND MANUFACTURES (INCORPORATED), Cutlers' Hall, Church Street, Sheffield 1—The Sheffield Chamber of Commerce has served industry and commerce since 1857. Publication of Quality of Sheffield (1s. 6d., postage 6d.) is one of the many ways in which the organization serves its members. The magazine is published shortly following the end of the month by which the edition is known, so as to contain as much as possible of the more topical news of the month. The latest (August) issue contains much of interest to the Sheffield area industrialist and, indeed, of interest to those engaged in industry in all parts.

IMPERIAL CHEMICAL INDUSTRIES, LIMITED, Imperial Chemical House, Millbank, London, S.W.1—Over the past few years an unfamiliar name, Argentina, has begun to figure in ICI's foreign investment plans: in fact, within the last three years nearly £13,000,000 of new investment in Argentina has been backed by ICI. All this capital is being handled by the ICI subsidiary, Duperial, the chairman of which, Arthur Edbrooke, writing in the September number of the ICI Magazine (2d.), answers such questions as: "What are the calculations behind this big new stake in the second largest country of South America?" and "In short, why Argentina?"

ENGLISH ELECTRIC COMPANY, LIMITED, Stafford—"Multi-rope Friction Winding at Wearmouth Colliery" is one of the three main articles in the September number of the English Electric Journal. The author is A. White, of the company's mining division. He writes: "In retrospect, the trend of development at this colliery (Area No. 1, Durham Divisional Coal Board) towards the winning of coal with ever-increasing efficiency and safety is representative of the requirements of the industry. In the future, selective application of new techniques and the continuance of the close co-operation between user and manufacturer will accelerate the advance in productivity." Other features of the issue include "A.c./d.c. Welding Equipment," by R. H. Boughton, manager, welding equipment division, and "The Role of the H.R.C. Fuse in the Protection of Low- and Medium-voltage Systems," by E. Jacks, chief engineer, fusegear division.

RICHARD THOMAS & BALDWINS, LIMITED, 82, Brook Street, London, W.1—Starting with the September issue, a special Spencer Works edition of Ingot News is being published monthly to serve the growing number of RTB employees on the site. That edition, like all regional editions of the paper, carries general company news of interest to all employees, but the change

means that more space is now available for local news and pictures. Monks Ditch flows serenely through the busy Spencer Works site. Dominated by the big white cooling towers, a fine colour photograph in the September issue also shows the blast-furnace zone and the heavy girdering for the steel plant. Now diverted into a concrete channel, the original ditch was a drainage channel first cut way back in the 14th century, or perhaps earlier, by the monks from a monastery fringing the Severn Estuary at Goldcliff. It ran diagonally across the works site, through the present sinter plant area.

NORTH-EASTERN DIVISIONAL COAL BOARD (Secretary's Department), The Lodge, South Parade, Doncaster—The golden jubilee of Maltby Main Colliery, No. 1 (Worksop) Area, took place in June. In 1911, the No. 2 shaft, which had been sunk to a depth of 820 yd., reached the rich seam of Barnsley Bed Coal after three years' work. Shortly afterwards a second shaft (No. 1) also reached the seam. A brochure has now been produced to commemorate the colliery's jubilee; it is an interesting and valuable record. Although only one seam is now worked, Maltby Main is one of the most productive pits in the Yorkshire coalfield, with an annual saleable output last year of 800,000 tons. The seam is between 6 ft. and 8 ft. in thickness, and working conditions are among the best in the county. The brochure traces the history of the colliery from 1908 and leads up to its modernization in recent times. The £3,000,000 reconstruction scheme is, in fact, almost completed. As the publication emphasizes, Maltby Main is a colliery with an assured future.

INTERNATIONAL HARVESTER COMPANY OF GREAT BRITAIN, LIMITED, 259, City Road, London, E.C.1—Almost exactly 110 years ago, Cyrus Hall McCormick, founder of the International Harvester Company, and inventor of the world's first successful horsedrawn reaper, exhibited his machine at the Great Exhibition in the Crystal Palace, London. It was the first showing of his brain-child outside America, and the reaper, besides attracting much attention because of its new mechanical principles, carried off the Gold Council Medal, the highest award of the show. The vast steel and glass Crystal Palace building, conceived and built in eight months, was originally erected in Hyde Park. Six and a quarter million people, including Queen Victoria, visited it during the four-month run of the Great Exhibition, which closed on October 11, 1851. In 1866, fire caused considerable damage, but the Palace was restored and continued to maintain its popularity as a rendezvous for meetings and exhibitions until 1936, when flames again engulfed it. This time, the building was so completely gutted that it was never rebuilt. The grounds, however, still retain the old title and this year came International Harvester's second showing at the Crystal Palace, this time in a role which would have been unfamiliar to McCormick—that of constructional equipment manufacturers. The International Construction Equipment Exhibition attracted 32,862 visitors from all over the world. The exhibition is featured in the summer number of Harvester Round.

DECREE No. 5038 of the Argentine Government, dated June 22, provides that special concessions will be granted to national enterprises that establish steel plants or expand existing plants. The concessions will take the form of exemptions from Customs duties and exchange surcharges on equipment, machinery, spare parts, and raw material for the plants, provided that these items are not produced in sufficient quantity in Argentina, and specified tax reliefs.

FORTHCOMING EVENTS

SEPTEMBER 25

Institution of Plant Engineers (West and East Yorkshire Branch):—Meeting at the Houldsworth School of Applied Science, University of Leeds, at 7.30 p.m. "Construction of Bradwell Heat Exchangers," by J. Shaw and G. Cain.

SEPTEMBER 26

Combustion Engineering Association (North Western Region):—Visit to Fibreglass, Limited, St. Helens (Lancs).

Society of Instrument Technology:—Meeting at Manson House, 26, Portland Place, London, W.1, at 7 p.m. "Underground Gasification of Coal—Some Features of Instrumentation," by Dr. A. E. Balfour, and "Trends in Mining Instrumentation," by A. E. Bennett.

Institution of Plant Engineers (South Wales Branch):—Meeting at the South Wales Institute of Engineers, Park Place, Cardiff, at 7.30 p.m. "Industrial Use of Gas," by W. H. Tarn.

Institution of Mechanical Engineers (Scottish Branch):—Meeting at the Pentland Hotel, Thurso, at 7.30 p.m. "Fluid Power Transmission with Particular Reference to Hydrostatic Transmission," by D. Firth.

SEPTEMBER 28

Midland Counties Institution of Engineers:—Annual dinner and dance at the Sherwood Rooms, Greyfriar Gate, Nottingham, at 7 p.m.

Institution of Plant Engineers (Merseyside and North Wales Branch):—Meeting at the Exchange Hotel, Liverpool, at 7.15 p.m. "The Natural Ventilation of Industrial Buildings," by F. E. Grandidge.

Institution of Plant Engineers (Sheffield Branch):—Meeting at the Grand Hotel, Sheffield, at 7.30 p.m. "Industrial Relations," by W. Carron, president, Amalgamated Engineering Union.

Institution of Mechanical Engineers (Scottish Branch):—Meeting at the Royal College of Science and Technology, Glasgow, at 7.30 p.m. "Fluid Power Transmission with Particular Reference to Hydrostatic Transmission," by D. Firth.

National Association of Colliery Managers

SEPTEMBER 26

South Wales Branch:—Meeting at the Castle Hotel, Neath, at 6 p.m. "The Colliery Manager and the National Coal Board's Medical Services," by Dr T. H. Jenkins, divisional medical officer, South-Western Divisional Coal Board.

SEPTEMBER 27

Lancashire Branch:—Meeting at the Manchester Literary and Philosophical Society, 36, George Street, Manchester, at 4 p.m. Presidential address.

Course on "Applied Physical Chemistry for Metallurgists"

COURSE of 10 lectures on "Applied Physical Chemistry for Metallurgists" is announced by the Metallurgy Department of Battersea College of Technology. The lecturer will be Dr. J. Mackowiak, A.I.M. The lectures will be on Wednesdays at 6.30 p.m., starting on October 11.

The course has been designed to meet the needs of those employed on research and production who either completed formal studies some years ago, or whose professional training did not include any previous study of the subject. It is intended that the course, while complete in itself, will also serve as a preliminary for further courses on specific topics.

Details may be obtained from the Secretary (Metallurgy Courses), Battersea College of Technology, London, S.W.11.

A NEW BLAST FURNACE recently blown in at De Wendel's Joeuf works (Meurthe-et-Moselle) is said to be the largest in France. Daily production is around 900 tons.

PIG-IRON AND STEEL PRODUCTION

IN the following United Kingdom pig-iron and steel statistics, issued jointly by the Iron and Steel Board and the British Iron and Steel Federation, Table 1 gives the production of pig-iron and ferro-alloys and the number of furnaces in blast in July. Table 2 gives the production of steel ingots and castings in July and Table 3 gives details of finished steel in June. Activities of the industry are summarized in Table 4.

TABLE 1.—*Weekly Average Production of Pig-iron and Ferro-alloys in July*, 1961. (*Thousands of Tons.*)

District.	Furnaces in blast.	Hematite.	Basic.	Foundry and forge.	Ferro-alloys.	Total.
Derbys, Leics, Notts, Northants, and Essex	20	—	27.2	18.8	—	46.0
Lancs (excl. N.-W. Coast), Denbighs, Flints, and Ches	8	—	21.1	—	2.2	23.3
Lincolnshire	10	—	42.4	—	—	42.4
North-East Coast	15	2.3	52.7	—	—	55.0
Scotland	6	0.1	16.3	1.2	—	17.6
Staffs, Shrops, Worcs, and Warwicks	5	—	9.0	1.0	—	10.0
South Wales and Mon	11	0.6	61.6	—	—	62.2
Sheffield	2	—	2.9	—	—	2.9
North-West Coast	6	16.5	—	0.7	—	17.2
Total	83	19.5	233.2	21.7	2.2	276.6
June, 1961	86	24.4	247.7	23.0	2.3	297.4
July, 1960	84	23.0	237.5	24.3	4.1	288.9

TABLE 3.—*Weekly Average Deliveries of New Non-alloy and Alloy Finished Steel.* (*Thousands of Tons.*)

Product.	1959.	1960.	1961. June.*	1961. May.*	1961. June.
Non-alloy steel:					
Ingots, blooms, billets, and slabs‡	5·1	5·6	5·2	7·3	7·2
Heavy rails	6·8	8·7	8·4	8·0	9·2
Sleepers	0·6	0·8	0·6	1·3	0·7
Fishplates and soleplates	0·4	0·6	0·5	0·9	0·7
Plates, 3 mm. thick and over:					
(i) Over ⅜ in.	24·8	30·9	29·3	37·7	34·6
(ii) Under ⅜ in.	18·3	22·0	21·3	24·2	23·6
Other heavy prods.	41·2	53·1	53·1	52·6	53·0
Ferro-concrete bars	9·6	12·0	12·6	15·0	13·9
Wire rods	23·5	28·6	29·1	28·0	27·5
Arches, etc.	7·8	7·9	8·4	8·0	7·8
Other light sections	33·0	41·3	40·7	38·0	37·8
Bright steel bars	7·6	9·7	9·5	9·0	9·6
Hot-rolled strip	27·4	33·1	33·8	28·0	29·5
Cold-rolled strip	8·0	10·0	9·9	9·3	9·1
Sheets, incl. coated:					
(i) Hot rolled	11·8	12·9	12·8	11·1	10·1
(ii) Cold reduced	35·2	40·6	39·5	38·2	40·1
Tinplate:					
(i) Hot dipped	7·7	8·0	8·0	6·4	6·5
(ii) Electrolytic	13·2	14·4	14·4	12·9	14·6
Blackplate	0·7	0·9	0·9	0·6	0·7
Tubes up to 16 in.	20·6	23·8	24·6	21·8	24·3
Tube fittings, etc.	0·4	0·4	0·4	0·4	0·4
Tyres, wheels, and axles	2·4	2·4	2·2	1·9	2·3
Forgings (excl. drop)	2·1	2·2	2·1	2·2	2·4
Steel castings	3·6	4·3	4·2	4·5	5·0
Tool steel	0·2	0·2	0·2	0·2	0·3
Total	312·0	374·4	371·7	367·5	370·9
Alloy steel	18·2	22·5	21·7	22·3	25·1
Total deliveries from UK production†	330·2	396·9	393·4	389·8	396·0
Add: Imported finished steel	7·1	19·1	29·4	3·5	5·0
	337·3	416·0	422·8	393·3	401·0
Deduct: Intra-industry conversion§	47·6	56·4	57·3	51·7	53·3
Total new material	289·7	359·6	365·5	341·6	347·7

† Includes finished steel made from imported ingots and semis.
‡ Other than for conversion into any other form of steel listed.
§ Material for conversion into other products also listed in this table.

TABLE 2.—*Weekly Average Production of Steel Ingots and Castings in July*, 1961. (*Thousands of Tons.*)

District.	Open-hearth. Acid.	Open-hearth. Basic.	Bessemer and LD.	Electric.	All other.	Total. Ingots.	Total. Castings.	Total ingots and castings.
Derbys, Leics, Notts, Northants, and Essex	—	4.4	14.8 (basic)	2.5	0.1	20.4	1.4	21.8
Lancs (excl. N.-W. Coast), Denbighs, Flints, and Ches	1.5	30.8	—	4.7	0.4	36.1	1.3	36.1 / 1.3
Yorkshire (excl. N.-E. Coast and Sheffield)	—	40.5	—	—	0.1	40.5	0.1	40.6
Lincolnshire	0.9	73.0	—	1.8	0.4	74.0	2.1	76.1
North-East Coast	0.4	16.5	—	2.0	—	17.5	1.4	18.9
Scotland	—	23.6	—	4.3	0.7	26.7	1.9	28.6
Staffs, Shrops, Worcs, and Warwicks	1.4	71.0	20.4 (basic)	0.7	0.1	93.2	0.4	93.6
South Wales and Monmouthshire	8.3	33.9	—	14.3	0.3	54.9	1.9	56.8
Sheffield (incl. small tonnage in Manchester)	0.1	—	5.4 (acid)	0.9	—	6.2	0.2	6.4
North-West Coast								
Total	12.6	293.7	40.6	31.2	2.1	369.5	10.7	380.2
June, 1961	14.2	357.1	39.4	34.7	2.1	435.4	12.1	447.5
July, 1960	9.6	317.6	36.7	25.7	1.8	382.6	8.8	391.4

TABLE 4.—*Iron and Steel Price Index and General Summary of Pig-iron and Steel Production.* (*Weekly Average in Thousands of Tons.*)

Period.	B.o.T. Price Index, 1938 = 100. Iron and steel.	Coal. ††	Basic materials§	Iron-ore output.	Imported ore used.	Coke sent to blast furnaces.	Pig-iron, ferro-alloys prod.	Scrap used in steel prod.	Steel (incl. alloy). Imports.†	Prod. ingots, castings.	Delivrs. finished steel.	Stocks.‡
1959	340	496	477	286	244	210	242	208	7	388	291	2,244
1960	339	505	482	329	319	264	303	243	24	467	361	2,702
1961—April	339	538	482	313	322	261	308	244	6	472	355	2,745
May*	340	520	484	333	304	254	300	244	5	466	343	2,754
June	341	520	479	326	298	249	297	233	5	447	349	2,679
July	342	520	477	312	270	238	277	196	7	380	310	2,598

* Months contain five weeks, all tables.
† Weekly average of calendar month.
‡ Stocks, ingots, semi-finished and finished steel at the end of the years and months shown.
†† The index for coal is now based on prices ruling on the last day of each month.
§ Used in non-food manufacturing industries.

Coal in Oxfordshire

SUBSTANTIAL progress in detailed geological mapping throughout Great Britain is described in the 1960 report of the Geological Survey and Musuem, published for the Department of Scientific and Industrial Research by the Stationery Office (5s.). Discoveries of economic significance made during the year include coal seams in Oxfordshire and a bed of anhydrite in Northern Ireland, in both cases of workable thickness, and ascertaining that the reserves of salt in Cheshire are double the previous estimates.

The discovery of coal in a borehole at Apley Barn, Witney, about 10 miles from Oxford, was announced last July. It is the first coal to be found in Oxfordshire of a workable thickness. Coal Measures were proved from 820 ft. to 3,968 ft., and boring ceased on August 22 at a depth of 4,942 ft. This work was part of the Geological Survey's long-term programme of borehole drilling undertaken to obtain information on the relationship and composition of the deeper rocks in southern England, and was the third borehole commissioned by the survey between the river Severn and Oxford.

Boring began in August, 1960, and Upper Coal Measures were first struck at 820 ft. Between 1,000 and 1,948 ft., 19 thin coal seams were proved, and one 3-ft. thick at 1,662 ft. The next 655 ft. passed through were of variegated coloured mudstones, relatively barren of coal; the Second Coal Group at the dept of 2,603 ft. was found to contain 20 ft. of coal in 11 seams, three of them over 2 ft. 8 in. thick. Under this group was a Pennant Sandstone-like group of rocks containing eight coal seams totalling 14 ft., including a 6-ft. 1-in. seam at 3,633 ft., of which the bottom 4 ft. 11 in. is coal, and another 6-ft. 4-in. seam at 3,786 ft., of which the bottom 4 ft. 9 in. is coal.

Beneath this group lie conglomerates and sandstones of Devonian age to a depth of 4,942 ft.; there are thus 3,148 ft. of the Upper Coal Measures in this borehole and no Middle or Lower Coal Measures. The National Coal Board is at present analysing the coals.

If it were decided to explore the extent of the coalfield by boreholes this would be a lengthy procedure and would not be the responsibility of the Geological Survey of Great Britain, though the survey would give geological advice if it were sought. If further boreholes proved a number of good quality coal seams at a workable depth over a wide enough area, consideration might then have to be given to sinking a colliery shaft, the site of which would almost certainly be near a railway line.

In the Witney borehole, in rocks lying above the Coal Measures at a depth of 171 ft., a representative of the Banbury iron-ore bed was found which, unlike the 20-ft. thickness of this bed where it is worked north-west of Banbury, was only 1 ft. 9 in. thick, well below commercially workable thickness.

Safety Campaign in US Mines

DURING 1960, a campaign was conducted in United States coal mines in an attempt to curtail the accidents caused by falls of roof. This was the second campaign conducted by the US National Safety Council and all mines were invited and urged to enrol. The results of the campaign were analysed in a paper presented at the 36th annual Western Pennsylvania Safety Engineering Conference and Exhibition by Mr. Clinton H. Hoch, and which was published in the July, 1961, issue of Mechanization.

One of the requirements of participation in the campaign was that each mine was required to furnish simple reports, including the number of injuries resulting from falls of roof or rib for one of the three years prior to 1960, a similar report covering the first six-month period, and a final report covering the last six months of the campaign.

A total of 1,423 mines was enrolled in the campaign; 821 failed to send in any reports. A total of 385 mines, or 27 per cent. of those enrolled, submitted all the required reports. Of these mines, 264 achieved the goal of a 50 per cent. or more reduction in injuries caused by falls of roof. A 25 per cent. frequency rate reduction in total injuries was achieved by the 385 reporting mines, based on their combined injury experience. This reduction represented 35 lives saved and 228 non-fatal injuries prevented.

It is interesting to note that there were 50 fewer fatal injuries, and 409 fewer non-fatal injuries caused by falls of roof during the campaign year than occurred during the reported base period. Comparing the overall injury experience of 1960 with that of 1959, as shown in the US Bureau of Mines annual summary of coal-mining injuries and employment, it is found that there was a 0.4 increase in the overall injury rate per million manhours exposure during 1960. There was an increase of nine fatal accidents caused by roof falls alone.

This adverse trend occurred while the 385 participating mines were achieving a 25 per cent. reduction in their frequency rate of injuries from falls of roof.

A DÜSSELDORF REPORT states that Turkey has obtained a credit of $12,000,000 from France for the new steelworks at Eregli. Turkey is stated to be negotiating with West Germany and Italy for a further $8,000,000 for the works.

IRON AND STEEL TRADE

PRODUCTION figures for August together with present trends have done little or nothing to relieve the gloom or point to improvements in the near future. The indications are that the industry is working at about 78 per cent. of capacity and only a rally now can save September from returning production figures as bad if not worse than those for August. In the heavy steel trade of the North-east Coast it is questionable whether as much as 75 per cent. of available capacity is now employed and, so far as plates are concerned, this could be even less.

Pig-iron

Foundry grades of pig-iron are plentiful and makers have no difficulty in coping with orders arising. The better demand seems to be for the low phosphorus irons, the major call coming from the engineering and speciality foundries for the production of high-quality castings. They are also taking up reasonably good tonnages of hematite and refined iron.

Demand, however, tends to fluctuate considerably and there is little forward buying, mainly because of the present easy supply position and the uncertainty of future requirements.

Ferro-alloys

The demand for ferro-tungsten has weakened, but ferro-vanadium and ferro-molybdenum remain in fair request. The demand for ferro-silicon is moderate, but silicon metal is a quiet feature. Both the low and high carbon grades of ferro-chrome are receiving reasonable attention, and calcium silicide is fairly active.

There is a steady demand for ferro-titanium, but ferro-niobium is slightly quieter. There is a fair call on chromium metal.

Semi-finished Steel

There is little, if any, change in the trading position at the re-rolling mills, most of which are short of work. Plants are working much below their productive levels and day-to-day arisings of orders, apart from reinforcing rods and bars, are only moderate at best.

The demand for small bars, light sections, strip, etc., is barely sufficient to make up rolling programmes and entails many roll changes for the meagre tonnages now being booked.

Finished Steel

Sections, joists, and rails are a little stronger than the demand for plate, and universal beams have been the most successful in retaining their attraction for buyers, probably because the tonnage available has been so restricted from home sources that there has not been an opportunity for the big steel users to accumulate sizeable stocks.

Capacity is still available for flat and corrugated galvanized sheets, in spite of the fact that demand continues to be maintained at a fairly good level. The situation is pretty much the same with regard to special alloy and high carbon steels.

A STEPPED-UP DRIVE for growing Far Eastern markets where the use of steel and aluminium is reported near an all-time record, has been announced by the Morrison Steel Export Corporation, USA. The company recently concluded sales representation agreements in a number of Far Eastern countries.

£100,000 Finnish Order for Head Wrightson

VALUED at about £100,000, an order has been received by the Head Wrightson Machine Company, Limited, Middlesbrough, a subsidiary of Head, Wrightson & Company, Limited, from the Finnish metalliferous mining and copper producing company Outokumpu Oy, of Pori, for the supply of a large tube drawbench to be used in the manufacture of non-ferrous tubes.

The bench is to be of the single chain triple draw type, having a maximum pull of 100,000 lb. and capable of drawing tubes up to 150 ft. and provided with special electrical equipment to give infinitely variable speeds of draw up to a maximum of 300 ft. per minute.

Arranged for semi-automatic operation, the bench will incorporate special features developed in recent years to enable high rates of production to be achieved with one-man operation.

Ferro-chrome Smelter for Southern Rhodesia

NEW smelter to be erected in Que Que, Southern Rhodesia, will produce initially 12,000 tons a year of high-carbon ferro-chrome from local chromite ores. The smelter will be rated at over 7,500 kVA, using Kariba power for smelting about 25,000 tons per annum of chromite concentrates. Building work is to start immediately.

Company responsible for the project is Windsor Ferroalloys (Private), Limited, with John Miles & Partners (London), Limited, as consulting engineers. The company has taken over Windsor Chrome Mines, which has operated for some years in this area, and head of the new company is Mr. Leo H. Timmins, who for many years has had a controlling interest in the Windsor Mines. The other directors are Mr. John A. Timmins and Mr. John J. Shannon, both of Montreal, Canada.

The new company has an authorized capital of £150,000. Over £300,000 has already been invested in Rhodesia by Mr. Timmins and his Canadian associates, but the smelter operation will create an additional capital requirement of two-and-a-half times that figure.

OUTPUT FROM the Lackenby universal beam mill of Dorman Long (Steel), Limited, which began commercial production in July, 1958, now exceeds 1,000,000 tons.

Coalfield News

Short List for Yorks NUM Vice-presidency

OF the original 22 candidates for the vice-presidency of the Yorkshire Area of the National Union of Mineworkers, five remained after an executive meeting at Barnsley on Tuesday. Miners will vote on October 16, 17, and 18. The short list, announced by Mr. Sam Bullough, the Area president, is:—

Mr. Jock Kane, delegate for the Armthorpe Colliery branch; Mr. Jack Leigh, delegate for the Bowers branch, in the Castleford Area; Mr. Harry Fish, delegate for the Wentworth Silkstone branch; Mr. Fred Jerram, Maltby branch secretary, and Mr. Tommy d'Arcy, former branch president at Silverwood Colliery, who is now a safety inspector for the Yorkshire coalfield.

THE Durham Divisional Coal Board is to erect a fire and rescue station at Murton Colliery.

Mr. A. FOTHERINGHAM (69), of Lochore (Fife), who retired two years ago after 54 years' service in the mining industry, celebrated his golden wedding on Saturday.

FORMER WORKMATES of Mr. Joe Hallsworth, the Nottinghamshire miner who failed to qualify for his £200 retirement bounty because of illness, have already collected £100 for him.

MINER AT Wharncliffe Woodmoor Colliery (Yorks), Mr. James Beaumont, has won the trophy for the best-kept garden on Barnsley Corporation housing estate for the fifth time.

FIRE WHICH BROKE OUT underground at Blairhall Colliery, Fife, on September 12, was brought under control in 20 minutes, after a rescue brigade had been called from Cowdenbeath in case of an explosion. The cause of the fire is being investigated.

DONCASTER Rural District Council housing committee has agreed in principle to build houses for incoming miners to be recruited by the NCB for work at Rossington and Edlington. The board states it will require 200 houses at each place during 1962.

OFFICIALS OF THE National Coal Board and the National Union of Mineworkers decided last Sunday to close temporarily the Silkstone Seam at Cortonwood Colliery, near Wombwell (Yorks), for a check on gas emission. About 350 miners will be transferred to neighbouring pits.

RETIRING SCOTTISH Area president of the National Union of Mineworkers, Mr. Abe Moffat, received a cheque representing money raised by pit donations and collections throughout Fifeshire at a function at Lochgelly last Saturday. It was presented by Mr. Andrew Flynn, of Valleyfield Colliery, the longest-serving pit delegate.

COLLIERY FIREFIGHTING teams from the East Midlands Division of the National Coal Board met at Mansfield last week for the annual competition. Winners of the four sections were:—Surface team, Sherwood Colliery; underground team, Willing Colliery "B" ("A" team); surface individual test, J. Starkey, Church Gresley Colliery; underground individual test, L. J. Davis, Babbington Colliery.

Mr. ERIC BIRKIN, a miner at Moorgreen Colliery, Newthorpe (Notts), won the medium challenge cup at the National Chrysanthemum Society show in London last Friday, with three vases of early flowering chrysanthemums. His only other exhibit at the show, a vase of nine large chrysanthemums, won a fourth prize. Mr. Birkin also won the cup in 1958 and another major trophy at the society's show in 1956.

PLANS FOR THE commercial use of methane gas drained from collieries may be announced by the North-Eastern Divisional Coal Board at the end of this year. At present the Yorkshire coalfield has 26 pits with drainage installations extracting more than 4,000 cu. ft. of pure methane per minute. About 1,500 cu. ft. per minute is being discharged through pipes at the surface at five collieries.

FIRST PHASE of the erection of a complete coal preparation plant for Elsecar Main Colliery, near Barnsley, in the North-Eastern Division of the Coal Board, has been completed by the contractors, the Don Valley Engineering Company, Limited, Doncaster. Work on the site started in January and the first stage, comprising raw coal and dirt-handling equipment and washery has already been put into operation.

Coal Output Tops 1960 Figure

OUTPUT of saleable coal rose last week by about 250,000 tons to 3,738,600 tons, 19,000 tons more than a year ago, but in the previous week productivity dropped slightly to 81.4 cwt. at the face and 28.2 cwt. overall. While this is well above last year's figure, it is below the average for the year so far.

Stocks continue their trend of the past few months. Undistributed stocks continue to fall and at 22,366,000 tons are 12,300,000 tons below the comparable figure for 1960. Consumers' stocks are steadily building up and now top the 16,000,000-ton mark.

There were 564,050 wage-earners on colliery books on September 9, against 590,300 on September 10, 1960, the numbers engaged at the coal face being 211,280 and 224,250 respectively. Total absenteeism (all workers) in the week ended September 9 was 14.91 per cent., compared with 14.49 per cent. in the week ended September 10, 1960. Output at the face was 4.070 tons and overall 1.410 tons in the week ended September 9, compared with 3.896 and 1.370 tons in the week ended September 10, 1960.

The following table gives (in tons) the provisional figures of output of saleable mined coal by division in the week ended September 16, and the tonnage lost through disputes:—

Division.	Week ended September 16, 1961.		Week ended September 17, 1960.
	Total output.	Tonnage lost.	Total output.
Scottish	334,000	23,000	333,000
Northern (N&C) ..	236,000	—	248,000
Durham	452,000	—	465,000
North-Eastern ..	774,000	16,000	780,000
North-Western ..	224,000	14,000	226,000
East Midlands ..	836,000	68,000	833,000
West Midlands ..	281,000	—	256,000
South-Western ..	362,000	5,000	382,000
South-Eastern ..	28,000	—	27,000
Great Britain—			
Deep-mined coal ..	3,527,000	126,000	3,550,000
Open-cast coal ..	168,000	—	128,000
Other deep-mined (including licensed mines) ..	43,000	—	41,000
TOTAL	3,738,000	126,000	3,719,000

THE COAL TRADE

SHORTAGES of the better quality coals and premium smokeless fuels are fairly prevalent in most districts. The former appears to be caused by the backwash of colliery holidays and should adjust itself in the near future. Improvement in the delivery of the smokeless fuels such as Coalite and Phurnacite is not foreseen for some time as the demand is likely to increase well beyond the limits of reasonable supply. Merchants will have to content themselves with pushing alternatives or chance losing custom to other fuels by repeated excuses for delivery delays.

WEST MIDLANDS

Public demand for house coal has been fairly strong since the annual holiday period, the approach of winter prices being a factor in the strength of the market. Trade buying to build up depot stocks has been consistently good throughout the summer months; regular merchant stockists are carrying heavier-than-usual stocks, while dealers and wholesalers who have rarely stocked are holding substantial tonnages. The majority of merchants are taking full contract tonnages, though in some instances merchants have suspended house nuts.

Supplies from some Warwickshire and Leicester pits have been under contract schedules, but on the whole West Midland pits have done well for their contractors. Buying of some top quality coals from one or two Staffordshire pits has not been sufficient to absorb the whole of production, but apart from these coals which have usually only a local appeal, all other collieries have had little or no trouble in disposing of all saleable house coal during the summer. In some respects the future supply position is better than a year ago; householders hold higher stocks, depot stocks are considerably larger and production from local pits is moving upward.

The shortage of anthracite of the better type continues to make it difficult to meet the volume of business on offer. Best stove nuts and beans are very tight, but where householders' requirements of grains has been registered with producers, supplies are usually forthcoming though delays are not unusual. Stockpiling of the special coals at depots is not satisfactory and it is expected that alternative fuels will have to be supplied to meet winter requirements. Sales of Sunbrite are expanding as customers get used to the fuel. An improved demand has arisen for domestic coke, mainly due to the approaching ending of summer prices. Householders have no great stock of coke in their cellars as it is generally known that gasworks hold substantial stocks. These stocks are nearly as high as they were at the beginning of last winter, but as they mostly consist of domestic sized coke, they may be heavily drawn upon during the winter if house coal is difficult. Preparations to market Gloco have been completed and marketing will begin on October 1.

Industrial demand is satisfactory and is matched by the supply position. Now and again particular colliery descriptions are in short supply, but usually a satisfactory substitute is available. Manufacturers have accumulated stocks equal to those acquired last year, representing 2/3 weeks' winter consumption. Power station requirements continue to expand.

The market for hard coke has not improved in recent weeks; indeed, purchases on account of the iron and steel section have been on a smaller scale. Blast-furnace coke is fairly firm and there has been an improvement in buying by engineering concerns. Hard coke nuts remain a weak feature, though with factory space heating near, ordering has started again.

Coal Chartering

DESPITE the fact that only a moderate volume of chartering has been concluded there is however a good general inquiry noted from the Hampton Roads area to most of the usual importing areas, and, judging from the improvement in the undertone and rates of freight for other commodities, it seems reasonable to assume that coal values must move in sympathy. In this respect it is interesting to note that Hampton Roads to Antwerp, Rotterdam, or Amsterdam has paid the improved figure of 29s. based on a 20,000-tonner for October shipment with 3,000 tons discharge free; subject to stem further business could be arranged. As far as Japan is concerned a parcel of 8,500 tons has been fixed for October at $9.35 and a 14,000-tonner for October 20/November 20 at 5 cents extra, both on the basis of six days Shinc.

Charterers continue to display interest not only in single voyages, but are willing to discuss contracts over next year. This also applies from Hampton Roads to the Brazils.

Nothing of interest has been reported from the UK; in certain cases stems are difficult to arrange but there are inquiries for tonnage to load from the Bristol Channel to the Mediterranean. Coasting tonnage is also required from this area to French destinations apart from the demand from the East Coast to Scandinavia.

Tyne Coal Trade Improves

COAL and coke shipments from the Tyne in the first eight months of the year at 4,000,000 tons showed an increase of 350,338 tons, or more than 9.6 per cent. over the same period on 1960, reports the Tyne Improvement Commission.

Coastwise cargoes at the end of August totalled 3,400,000 tons, an increase of 318,138 tons, while export cargoes were up by 35,439 tons to 548,989 tons. Bunker shipments declined by 3,121 tons to 22,950 tons.

MR. T. J. SAMUEL (81), who worked in the Monmouthshire coal mines for 45 years before he retired in 1937, has celebrated his diamond wedding. Mr. Samuel started work in the mines at Whitworth Colliery when he was 12 years old. He was appointed a colliery examiner in 1904 at Pochin Colliery and in 1917 became an overman.

Board Changes

C. & W. WALKER, LIMITED—Mr. John W. Brown has resigned from the board.

BARR & STROUD, LIMITED—Mr. Gordon M. Morrison has been appointed a director.

LION FOUNDRY COMPANY, LIMITED—Mr. R. M. Hudson has been appointed a director.

INGALL, PARSONS, CLIVE & COMPANY, LIMITED—Mr. J. M. Boodle has been appointed a director.

E. & F. BEATTIE, LIMITED—Mr. E. N. Dominy, traffic and transport manager, has been appointed a director.

CAPPER PASS & SON, LIMITED—Mr. G. S. W. Marshall has been appointed a director in place of Lt.-Col. S. G. C. MacWatters, who has retired.

CONSOLIDATED PNEUMATIC TOOL COMPANY, LIMITED—Mr. Norman Readman has been elected chairman. He is succeeded as managing director by Mr. S. H. Ireland.

ROYSTON INDUSTRIES, LIMITED—Mr. J. W. Hill has retired from the board, but remains a director of the subsidiary company, the Royston Engineering Company, Limited.

HAYWARD TYLER & COMPANY, LIMITED—Mr. H. Weston Howard has been appointed chairman, and Mr. A. C. Ball managing director of the company, a subsidiary of Stone-Platt Industries, Limited.

THOMAS VALE & SONS, LIMITED—Mr. K. L. Bourne has been appointed managing director from October 1. He succeeds Mr. L. R. Honeywill, who is relinquishing the position on September 30, but will remain a director.

MIRRLEES (ENGINEERS), LIMITED—Mr. J. B. Blakeborough has been appointed to the board. Mr. W. J. Talboys has been appointed general manager of Pott, Cassels & Williams, Limited. Both companies are subsidiaries of Mirrlees Watson Company, Limited.

MICROCELL, LIMITED—Mr. F. T. Jones, formerly production manager with Hunting Aircraft, Limited, has been appointed a director, and Mr. J. A. Grace, formerly manager of the commercial and sales division of the De Havilland Aircraft Company, Limited, has been appointed commercial director of Microcell, a subsidiary of BTR Industries, Limited.

WINSTON ELECTRONICS, LIMITED—Mr. F. Winston Reynolds, founder of the company, has relinquished the position of chairman and managing director and will now devote all his time to the exploitation of a new range of products. He will be succeeded by Mr. W. Allen Bridges, director of European operations of the Dynamics Corporation of America, of which Winston Electronics is a wholly-owned subsidiary.

DE VERE HOLDINGS, LIMITED—Mr. S. Stansfield has been elected to the board. He is deputy chairman and managing director of the Oxley Engineering Company, Limited. Mr. B. C. Morton has resigned as deputy chairman and managing director of Robert Dempster & Sons, Limited, and Mr. Stansfield has been appointed in his place. These changes follow the company's policy to integrate the engineering companies in the De Vere group. Robert Dempster & Sons and Oxley Engineering, while collaborating closely in technical matters, will continue to trade as separate companies.

TURNER & NEWALL, LIMITED—Mr. J. E. Hutton, until recently sales director of the Indian subsidiary, Asbestos Cement, Limited, will join the board of Turners Asbestos Cement Company, Limited, on October 16. Although the board of the new manufacturing subsidiary, Turners Asbestos Cement (Nigeria), Limited, has not yet been fully constituted, Turner & Newall representatives on that board will include Mr. R. M. Bateman, deputy chairman of the parent company, Mr. K. Neve, a director of the parent company, and Sir John Rankine, former Governor of the Western Region of Nigeria.

Citizenship Courses for Youth in Industry

YOUNG men from many leading Sheffield steel firms attended the first of a series of training courses in citizenship, sponsored jointly by Sheffield industry and the Church, which began at Hollowford, Castleton (Derbyshire), on Monday. Residential courses are provided in a training and conference centre which has cost £25,000, and it is hoped they will become a normal part of the industrial training of many young men. Much of the cost has been met by the Ministry of Education, the King George and Dulverton Trusts, and Sheffield industry.

At the first course were Mr. D. R. O. Thomas, chief education officer, United Steel Companies, Limited, and the centre's warden, Mr. T. S. Bulcock. Group leaders were Mr. Colin Green, of the educational staff of Samuel Fox & Company, Limited, a branch of United Steel; the Rev. Charles Grice, rector of Armthorpe, and Mr. Anthony Kennedy, of the research department of Swift, Levick & Sons, Limited.

Candidates are sponsored by firms or organizations for the courses, and on the first course were youths from Samuel Fox & Company; English Steel Corporation, Limited; Edgar Allen & Company, Limited; Cravens, Limited; Park Gate Iron & Steel Company, Limited; Steel Peech & Tozer branch of United Steel; Swift Levick & Company, Limited; Spear & Jackson, Limited; Shepcote Rolling Mills, Limited; George Sorby, Limited; Pilkington Bros., Limited, and Firbeck Colliery, near Worksop.

The centre will be opened officially by the Master Cutler, Mr. C. H. T. Williams, on Saturday.

Steel Firm Director Heads Czech Trade Mission

BRITISH trade delegation left London on Tuesday for informal talks in Prague with the Czech authorities on the promotion of mutual trade. The six-man delegation, which has the support of the Board of Trade, is led by Mr. C. G. Monk, a director of Enfield Rolling Mills, Limited, and chairman of the Anglo-Czech section of the London Chamber of Commerce.

The other members of the delegation are Mr. M. A. E. Bechtler (English Electric Company, Limited), Mr. J. N. Cooper (Shell International Petroleum, Limited), Mr. K. R. Turner (Guest, Keen & Nettlefolds, Limited), Mr. R. Wonfor (Vickers-Armstrongs, Limited), and Mr. A. R. B. Hore (head of the East European department of the London Chamber of Commerce).

Under a long-term trade agreement initialled on Monday, Czechoslovakia will export machines and equipment, including complete industrial plants, to Nigeria, who in return will send Czechoslovakia oilseeds, vegetable oil, rubber, and other products.

EBBW VALE works of Richard Thomas & Baldwins, Limited, despatched its 30,000,000th bag of basic slag from the plant last week. Widely used by Welsh farmers as a fertilizer, the slag is sold by RTB to Corby Basic Slag, Limited, for distribution and resale. Since production started at Ebbw Vale in 1939, over 1,500,000 tons of basic slag has been distributed throughout Wales and the border counties.

Company News

Fuel Oil Tax

REPEAL URGED BY TUNNEL CEMENT CHIEF

URGING the repeal of the tax on fuel oil, Mr. N. M. Jensen, chairman of the Tunnel Portland Cement Company, Limited, said last week that industrial production would have to be geared "more and more" to oil. He told the annual meeting that the company's application last month to import cheap Polish coal had been turned down by the Ministry of Power on the ground that in the present circumstances it was not considered to be in the national interest to grant such an application. He added: "I had better not comment on that."

Mr. Jensen said the Chancellor considered his Budget to be disinflationary, but to say this about the fuel tax did not make common sense. British industry was the most heavily taxed in Europe, and this tax was particularly bad because it added considerably to the cost of production of a number of basic industries.

"I hope no effort will be spared to urge the Government to repeal this mistaken measure of taxation. If we are going to join the Common Market, we shall presumably also be under the European Coal and Steel Community and therefore be on equal terms with others. As it is, we would be taxed out of the Common Market before we join it."

Inland Coal Supplies

Referring to a statement on behalf of the National Coal Board that the company had been offered coal for one of its inland plants which would be satisfactory Mr. Jensen said that the spokesman must have been unaware that the Coal Board was only able to offer road-borne coal, and the works in question happened to be designed for railborne coal. "Our experience with coal supplies," he declared, "was getting more and more difficult, not least on the question of quality, and we should not have been able to maintain the present standards of some of our products had we not been able to use oil."

Mr. Jensen said he was not unmindful of the handicaps under which the Coal Board were working, especially the heavy burden of debt it has to contend with and the not inconsiderable number of mines which no amount of mechanization could ever make really efficient. "It is becoming clear to most serious thinking people," he continued, "that there is a lot of pruning for Lord Robens to do if he is ever to make the coal industry a healthy one again. If the country is to obtain the maximum of economic prosperity, it will, in my opinion, have to gear its planning of increased industrial production more and more to oil."

The chairman later told the meeting that all the company's plants were now operating on oil, although they could easily be switched to burn coal. He said that the company had made good profits on exports, but over the next year or so, unless the fuel tax was repealed, it would have to suffer a loss on them.

MILES DRUCE & COMPANY, LIMITED, iron and steel stockholders, of London, W.3—Trading conditions have been difficult since the spring, report the directors, and at the moment "show no sign of improving," but, while profits for the half-year ended June 30 are below last year's level, they justify maintenance of the 10 per cent. interim. Last year's total was 22½ per cent. with the interim on capital prior to a one-for-four rights issue.

COLTNESS IRON COMPANY, LIMITED—Interim dividend for the year ending September 30 is unchanged at 5 per cent. Last year's interim was followed by a final of 7½ per cent.

J. SAMUEL WHITE & COMPANY, LIMITED, shipbuilding and marine engineers, of Cowes, I. of W.—Shareholders have given approval for the company's acquisition of the shares of J. Arthur Dixon, Limited.

JONES BALERS, LIMITED, agricultural machinery manufacturers, of Rhosemor (Flintshire)—The company has been acquired by Allis Chalmers (International). It will continue under the same name, but will be a wholly-owned subsidiary of the American company.

PICKFORD HOLLAND & COMPANY, LIMITED, manufacturers of basic bricks, fire-resisting products, etc., of Sheffield—Trading profit for the year ended July 2, 1961, increased from £350,864 to £477,789, and after all charges including tax of £164,750 (£94,650) there is a net profit of £151,916 compared with £111,636. The 20 per cent. dividend is repeated with a final of 15 per cent.

E. AUSTIN & SONS (LONDON), LIMITED, non-ferrous metal manufacturers and machinery merchants, of London, E.9—The chairman, Mr. Douglas J. R. Austin, states that it is foreseen that in the transitional phase of reorganization borrowings could rise for a short period to exceed the borrowing powers as at present defined. It is proposed, therefore, to ask shareholders to approve an increase in the maximum permitted. Exports exceeded imports last year by nearly £400,000.

UNIVERSAL ASBESTOS MANUFACTURING COMPANY, LIMITED—Announcing an unchanged interim of 5 per cent. on the increased capital, the board states that this is not intended to imply the maintenance of the same total rate of dividend as the previous year, but is solely to reduce the disparity between interim and final payments. The company continues to trade satisfactorily and present indications are that profits for the current year will be somewhat above those of the previous year.

R.F.D. COMPANY, LIMITED, manufacturers of survival, rescue, and industrial safety equipment, etc., of Godalming (Surrey)—Profits, before tax, for the year amounted to £183,485. The proposed final dividend

of 11 per cent. makes 16 per cent. for the year and is equivalent to the 20 per cent. distribution of the preceding 15 month period. The company is now a diversified organization and export trade is the major part of its turnover.

BARROW BARNSLEY (HOLDINGS), LIMITED—At the annual meeting, Sir Peter Roberts, the chairman, said the year under review had been one of the most eventful in the history of the company. In view of the increasing competition within the coking industry the almost identical results of the Barnsley District Coking Company, Limited, the operating subsidiary, must be considered satisfactory. It is the directors' policy, added Sir Peter, to maintain the coke ovens, by-product and ancillary plant at the highest level of efficiency to take advantage of any favourable trends in the industry.

ACROW (ENGINEERS), LIMITED—Consolidated trading profits for the year ended March 31, 1961, rose from £699,312 to £774,310, but the net balance was slightly lower at £297,533 against £303,461. A final dividend of 12½ per cent. makes a 50 per cent. total, compared with the previous equivalent of 43.18 per cent., taking a one-for-10 scrip issue into account. The figures this year include for the first time the profits of Thos. Storey, Limited, which now has the highest order-book in its history. Group sales are higher for the first five months of the current year than the corresponding period of last year.

VOKES, LIMITED, filtration and silencing engineers, of Guildford (Surrey)—The group has a very satisfactory order position, which is sufficient to ensure full production for some months ahead, says the chairman, Sir Ian Stewart-Richardson. He warns, however, that economies and curtailment of spending power must reflect directly on the group's customers, and the cancellation of long-term orders under such conditions is always a possibility. Negotiations are well advanced for the acquisition of a substantial interest in a small engineering company within the Common Market area.

Record Turnover and Profits by John Folkes

TURNOVER of John Folkes, Limited, forgemasters and general engineers, in the period to April 30, 1961, exceeded £5,500,000 compared with £4,000,000 previously, states Mr. J. H. Folkes, chairman, who thinks that the growth of the undertaking will continue dur'ng the current year. Both turnover and net profits last year created new records, and although the accounts cover a period of 13 months they contain no more than the results of 12 months' trading.

The chairman says that although it was felt that a small increase in the dividend could well have been paid on the results, in view of the Chancellor's request and having regard to the bank position, it was decided to maintain the dividend.

COAL AND COKE SHIPMENTS, coastwise and oversea, from the South Wales ports in the week ended September 8 reached their highest level for nearly 12 months. A total of 77,618 tons was the best since the week ended October 9, 1960, when 83,417 tons were shipped. It was 14,730 tons up on the previous week and 17,480 tons above the corresponding period a year ago. Figures for the six ports (with 1960 figures in parentheses) were as follows:—Newport, 14,897 (9,994) tons; Cardiff, 6,337 (6,758) tons; Penarth, 1,215 (2,947) tons; Barry, 18,595 (18,026) tons; Port Talbot, 37 (301) tons; Swansea, 36,537 (22,162) tons.

Law Cases

COLLIERY DEPUTY FINED

DEPUTY at Six Bells Colliery, Abertillery (Mon), Sydney Griffiths was fined £5 by Abertillery magistrates for beginning to charge a shot hole before it had been thoroughly cleaned out. He was also ordered to pay £2 2s. costs.

Colonel K. Treasure, prosecuting, said officials and shotfirers were provided with a detector to make sure there were no breaks in the shothole, and attached to this was a scraper which should be used for removing loose material in the shothole. Mr. E. Chivers, for Griffiths, said that instead of using the break detector, which was not handy, the deputy had used wire to scrape the hole. He had seen the hole was in order, but had not used the correct tool.

ACTION OVER FIRST-AID

MINER who contends that a dirty bandage put on a leg wound after an accident at Wellesley Colliery, Methil, Fife, later caused him to contract dermatitis, is suing the National Coal Board for £400 damages at Kirkcaldy Sheriff Court. Mr. George Gartshore, steel drawer, said that as a result of the dermatitis he could now do only light work which reduced his earnings by a half.

The NCB is submitting that the bandage was obtained from the first-aid kit. It was in a wrapper and contained a sterile dressing. Any subsequent dermatitis which developed must have arisen from unconnected causes.

The record in the action was closed by Sheriff Sinclair Shaw, who will hear a debate on October 16.

SHOTFIRER at Ogilvie Colliery, Thomas John Edwards was fined £3 with £2 2s. advocate's fee by Pontlottyn (Glam) magistrates for failing to ensure that a place at the colliery was made safe for ordinary working after shotfiring. It was stated that some time after shotfiring for which Edwards was responsible, a live shot was found in the coal.

CHARGED AT Scunthorpe Magistrates' Court with embezzling a total of £37 8s. 9d. on six occasions from his employers, the Yorkshire Hennebique Contracting Company, Limited, ferro-concrete specialists, of York, Charles Taylor (57), a clerk, was fined £2 10s. on each of the six charges. No order was made for the restitution of the money.

Further Rise in Industrial Output in July

THERE was a further rise in industrial production in July. According to provisional figures, the official index of production for all industries reached the record level of 125 during the month, on a seasonally corrected basis. This compares with 124 for the previous month and 120 for July of last year. A similar rise over the month is shown in the index covering the manufacturing industries alone.

The further rise reflects the continued high level of activity in the building, civil engineering, machine-tool, and general engineering industries. Although orders now appear to be coming in at a slower rate to some companies in these fields, the total volume of work on hand remains high. With capital expenditure remaining above last year's level, these groups are expected to be busy for several months. Car production in July was at its highest level since last September.

Company Meeting

THE

Powell Duffryn

GROUP

Continued Growth and Expansion

IMPROVED RESULTS WIDELY SPREAD ACROSS THE GROUP

The Annual General Meeting of Powell Duffryn Limited was held on September 20th in London, the Chairman, Sir Henry Wilson Smith, K.C.B., K.B.E., presiding. The following is an extract from his circulated statement:—

RESULTS

Consolidated Group Profit, after tax and after deducting minority interests, shows an increase of 17 per cent. over the previous year. More important, the Group Trading Profit, up 22½ per cent., is the highest in our history. This improvement was widely spread across the Group.

DIVIDEND

The Directors had intended to recommend an increase in the Final Dividend on the Ordinary Shares which would have made 18 per cent. for the year against 16 per cent., but confronted with the statement by the Chancellor of the Exchequer are recommending an unchanged dividend.

REVIEW OF GROUP ACTIVITIES

Shipping: With the completion this autumn of three ships now building, the fleet owned by Stephenson Clarke will consist of 40 ships compared with a pre-war fleet of some 16 ships.

Despite the many problems associated with coastal shipping and despite deep sea freights which are still too low from the ship-owners' point of view, the fleet has continued to trade profitably.

In addition to the fleet which it owns, Stephenson Clarke has continued to manage a further 53 ships.

Coal: This is still a most important side of our business to which much time and energy is devoted. It is comforting to be able to record that, during 1960, there was an increase of some seven million tons in the total quantity of coal consumed in the United Kingdom and that there was also some increase in coal exports. This was reflected in the trade of our Companies engaged in the distribution of coal. There would seem to be emerging a clearer picture of the Coal Board's policy and we are considering certain possible developments calculated to enable us to play an even fuller part in the United Kingdom coal trade. Already, in addition to our investment in suitable ships, further investment has been made, particularly in Associated Coal & Wharf Companies, designed to maintain at a high standard our coal installations and to improve the efficiency of coal preparation equipment.

Oil: Apart from the expansion of our coastal tanker interests, and the steady development of fuel oil inland sales, we have recently given special attention to the Group's oil storage business. This is a responsibility vested in Cory Brothers who, with the completion of certain additions to previously existing capacity, will have 275,000 tons of oil storage available at Barry, Birkenhead and Ipswich. A high proportion of this tankage is let under long-term contract and there is no lack of current demand for the balance.

After a careful survey of the demand for oil storage in this country and of alternative sites, the decision was taken to embark on a major expansion by the erection of an entirely new installation at Purfleet, on the Thames. When the development is complete it is estimated that 600,000 tons of storage will be available for oil, chemicals and other bulk liquid products.

Timber: Our timber businesses made steady progress. Improvements at the Queensferry insulation board mill are designed to expand our sales of special types of board.

Engineering: Powell Duffryn Engineering is developing new lines to fill the gap caused by the cut-back in orders for railway wagons. Powell Duffryn Carbon Products is engaged in machining graphite for the Hunterston atomic power station and in manufacturing equipment for the chemical industry.

Heating and Air Conditioning: This is an expanding activity, involving the manufacture and sale of boilers, radiators and related equipment by Powell Duffryn Heating Ltd. The Weatherfoil Company has made further progress in specialised heating and the Group's air conditioning business has been supplemented by the acquisition of Andrew Air Conditioning Ltd.

FUTURE PROSPECTS

Commenting on future prospects the Chairman said: The general outlook for the Group remains satisfactory. In the short-term, it is virtually impossible for me to be at all specific, at this date, on the likely out-turn of the current financial year, because so high a proportion of the Group profits is earned in the winter months and is dependent among other things on winter temperatures and weather. More generally, it still remains to be seen to what extent the Group will be affected by factors outside our control arising in the national and international economic sphere or directly resulting from action taken by the British Government. None the less, I have no reason to expect any deterioration in our affairs in 1961/62.

Copies of the full Chairman's Statement giving details of developments in the various sections of the Group can be obtained from the registered office of the Company: 8 Great Tower Street, London, E.C.3

SALIENT FEATURES:	1961	1960
	£	£
Consolidated Profit after Depreciation ..	2,563,854	2,156,500
Taxation	1,059,560	863,607
Net Profit after Taxation	1,504,294	1,292,893
Capital and Reserves	21,653,563	20,963,613
Capital Commitments	2,100,000	1,060,000
Total Group Assets	38,693,540	35,380,628

Orders Placed

Simon-Carves Coal Plant for Chile

DESIGN and supply of a coal preparation plant for Compania Carbonifera e Industrial de Lota, in Chile, South America, is to be carried out by Simon-Carves, Limited, Cheadle Heath, Stockport, a member of the Simon Engineering, Limited, group. The contract, worth about £200,000, is the first for coal preparation plant that Simon-Carves has won in South America.

The plant will be capable of handling 4,400 tons of coal each two-shift day and includes hand cleaning for large coal, Baum washing of two different qualities of coals of intermediate size, together with water clarification and coal handling equipment. The washing capacity is 260 tons an hour of 4 in. and 2 in. coals. Of the different quality coals, one is for metallurgical and the other for industrial use.

AEI-BIRLEC, LIMITED, has secured a £200,000 order to supply three roller hearth furnaces to the Corby Works (Northants), of Stewarts and Lloyds, Limited. The plant will be commissioned during 1962.

DESIGN and construction of a refinery near Durban for South African Petroleum Refineries (Pty.), Limited, is to be carried out by Foster Wheeler, Limited, London. It is expected to go on stream in 1964.

FOUR GENERATING SETS worth £170,000 to operate mine winding gear and other equipment at the Kalgoorlie, West Australia, goldfield, have been ordered from Mirrlees, Bickerton & Day, Limited, by North Kalgurli (1912), Limited.

ABOUT 11 miles of 27 in. and 30 in. dia. prestressed concrete pressure pipes and fittings is to be supplied by Stanton & Staveley Sales, Limited, near Nottingham, for the Medway Water Board. Worth about £259,000, the order is for trunk mains in connection with the Belmont water supply scheme.

OBTAINED IN THE face of Eastern competition, a contract to supply 1,000 Multiminor model 2 measuring instruments to Indonesia has been awarded to Avo, Limited, manufacturers of coil winding machines and electric measuring instruments, of London, S.W.1, a company in the Metal Industries, Limited, group.

CONTRACT HAS BEEN awarded to Crompton Parkinson, Limited, for supplying the electrical power equipment for the new Scottish factory at Bathgate being erected for the British Motor Corporation. The contract, which exceeds £100,000, covers the supply and installation of switchgear, power transformers, and mains cablework for the distribution of power in the factory.

ANOTHER ORDER from Indonesia has been placed with Associated Electrical Industries, Limited, which brings the total value of orders received this year from the Republic to £5,500,000. The latest contract, worth £4,500,000, is for cable and wire, which will be made at the Dagenham (Essex) works of Telephone Cables, Limited, a company controlled jointly by AEI and Enfield Cables, Limited.

CONTRACT worth £400,000 has been awarded by the Stanton Ironworks Company, Limited, to Stothert & Pitt, Limited, for the design, construction, and erection of a complete slag preparation plant at Stanton for the manufacture of road materials, railway ballast, filter media, tarmacadam and asphalt. The plant has a designed capacity of 200 tons per hour, with the possibility of increasing later to 300 tons per hour.

FOR THE Padiham "B" power station, near Burnley, the 120-mW. reheat boiler unit is being supplied by Simon-Carves, Limited, Cheadle Heath, Stockport. The unit, when in operation, will generate 860,000 lb. per hour of steam at 1,600 p.s.i. and 1,010 deg. F., with reheat to 1,005 deg. F. The boiler furnace will be of the continuous-slagging type which will convert the ash and dust into a hard, granular substance that can be easily handled for disposal purposes.

ORDER for what is stated will be the largest generator transformer in the world has been placed with Ferranti, Limited, by the Central Electricity Generating Board. The order is for four 570 mVA, 3-phase, 22/430 kV delta star connected, 50 c/s, double-wound generator transformers. The units will be installed at the coal-fired power station at West Burton (Notts), and will connect four 500 mW turbo-generators to the supergrid. The order is worth over £1,000,000.

BRITISH RAILWAYS, North-Eastern Region, has placed a contract with Dorman, Long & Company, Limited, Middlesbrough, for fabricated steelwork for a bridge carrying the road traffic over the railway at Bradley on the Leeds-Huddersfield line. The Eastern Region of British Railways has placed a contract with the Butterley Company, Limited, Butterley (Derbyshire), for steelwork for the reconstruction of a bridge carrying main lines over an aqueduct between Lea Bridge and Tottenham.

WORTH £24,000, an order has been placed with the Associated Electrical Industries, Limited, by Burla Biraderler, of Istanbul, for both a.c. and d.c. electronic motors to form part of the extension scheme at Karabuk steelworks. The motors will be supplied by AEI's motor and control gear division. The same division is to supply flameproof high-speed electronic motors, valued at £30,000, for the new B.P. California aromatics plant being built at the Kent oil refinery of the British Petroleum Company, Limited. AEI's construction (cable and lines) division has been awarded a contract by the Midland region, Central Electricity Generating Board, to reinforce existing 132 kV. circuits at Smethwick 132 kV. sub-station in the Birmingham area.

£1,000,000 METAL BOX FACTORY IN ITALY

PLAN of the Metal Box Company, Limited, for a new £1,000,000 factory in Italy has now received Treasury approval. Last month the company's proposal was refused following the Chancellor's "Little Budget." Now Metal Box has revised the terms of its application to the Bank of England to satisfy the requirements of investment oversea. The revised plans provide for financing expansion in Italy partly by remitting funds from Britain and partly by borrowing money abroad.

The company has shelved a scheme to build a £1,000,000 factory at Scunthorpe, although preliminary planning had been completed and an architect and contractor appointed. The company has told the corporation that its plans are postponed indefinitely.

BOILER WEIGHING 127 tons and over 66 ft. long was moved by Firth Brown Tools, Limited, Sheffield, across Carlisle Street East, from one workshop to another, on Monday. The boiler is for the Drakelow "C" Power Station, near Derby, and had to be moved for welding, machining, and testing. Two bogies and three locomotives were used, and the street was closed by police to traffic during the operation.

NEWS IN BRIEF

EXPLOSION OF GAS killed five miners and injured five others at Shincho coal mine, in the Saga prefecture of Japan last weekend.

A CAMPAIGN is to be launched in Ireland by the Amalgamated Engineering Union to improve apprentice training and to bring the general education of apprentices up to that of apprentices in England.

AN AGREEMENT with the Indian Government to provide the know-how for the establishment in India of a works for the production of tanks has been concluded by Vickers-Armstrongs (Engineers), Limited.

MANY new jobs will be provided when "Dixon's Blazes," site of the former ironworks of William Dixon, Limited, Glasgow, is developed as an industrial estate. The 35-acre site will accommodate about 20 factories of varying sizes.

MINING DEPARTMENT of the North Staffordshire College of Technology is, for the first time, to start in the autumn term a GCE level course in geology. If it proves a success, the course will be extended to evening class students.

WORK WAS RESUMED on Tuesday by 500 employees at the Merseyside engineering works of Tubewrights, Limited, who had been on unofficial strike since Wednesday last week in a demarcation dispute. Negotiations were begun with the management.

ABOUT 580 men employed in the steelmaking section of the Clydesdale Works, Mossend, of Stewarts and Lloyds, Limited, will be paid off this weekend for a fortnight. They are due to resume on October 8. The lay-off is due to excess production of steel.

MR. W. CARRON, chairman of the engineering council of the Confederation of Shipbuilding and Engineering Unions, is to put the engineering union's pay claim for all adult manual workers to the employers on Wednesday. The claim includes a demand for shorter hours.

NEW FACTORY has been opened in Salisbury, Southern Rhodesia, by Rhodesian Diamond & Carbide Products, Limited, to produce tungsten carbide drill rods, detachable bits, coal picks and borers, and all types of tungsten carbide tools and diamond crowns for the mining industry, reports Barclays Bank D.C.O.

FOUNDED BY THE late Mr. Frederick M. Parker in 1911, the Leicester engineering firm of Frederick Parker, Limited, celebrates its 50th annniversary this month. Mr. Parker started his business in a workshop under a railway arch in Leicester. With about 1,000 employees the business is now in the hands of his three sons.

IT IS ANNOUNCED BY George Cohen Sons & Company, Limited, that the new Northfield F.7 dump truck is now offered for hire. Several of these 8 cu. yd. capacity dumpers have been added to its contractors' plant hire fleet, and this will further increase the resources of a fleet which is already the largest of its type in Britain.

SHIPMENTS by United States steel manufacturers this month are expected to exceed the May total of 8,900,000 tons, setting a new monthly record for the year. The majority of steel companies predict October business will be better than September's, as a result of modest inventory building by customers who are stepping up operations.

EMPLOYEES AT THE Hereford works of Henry Wiggin & Company, Limited, manufacturers of nickel and nickel alloys, of Birmingham, who stopped work on Thursday of last week, because, they said, a woman canteen worker had been unjustly dismissed, decided to return to work on Monday. About 2,300 workers were involved in the stoppage.

AT A DINNER at the Cwmbran (Mon) works of Guest, Keen & Nettlefolds (Cwmbran), Limited, last Friday, Mr. J. A. Danielli, managing director, presented 68 employees with long-service awards. Among those who received awards were three brothers who have worked a total of 101 years for GKN. Three men received awards for 50 years with the firm.

PLANS TO DEVELOP coal ports at a cost of £A10,000,000 have been announced by the New South Wales Government. Funds have been supplemented by Federal aid, and the first phase will be undertaken at Port Kembla where modern coal-handling facilities will be installed at a cost of £A2,500,000. Other projects will be carried out at Newcastle and Balmain.

LLOYDS BANK, LIMITED, has appointed a receiver to Guy Motors, Limited, manufacturers of buses and heavy lorries, etc., of Wolverhampton. The company has borrowed heavily from the bank and has reported substantial losses in recent years. It has paid no ordinary dividends since 1957. Last published accounts showed an overdraft of £1,284,000 on July 31, 1960.

SHEFFIELD has nothing to fear from the enormous rate of growth of the South African steel industry, said Mr. T. W. Robinson, United Kingdom Trade Commissioner for Capetown, when he spoke to Sheffield Chamber of Commerce at the Cutlers' Hall last Friday. He said that although South Africa's steel industry was growing rapidly, Sheffield steel was of higher quality.

NEW "ADVENTURE CENTRE" at Pont-y-Pant, near Betws-y-Coed, Wales, established by Tube Investments, Limited, for its young employees of both sexes, was opened last Friday by Sir John Hunt, director, Duke of Edinburgh's Award. The first of its kind started by a company, the centre consists of a country mansion set in its own estate, from where mixed parties will be introduced to mountain activities and skills of living in the open.

DISPUTE OVER a pay claim which began in July at the Kilmarnock works of Glenfield & Kennedy, Limited, valve manufacturers and hydraulic engineers, ended on Wednesday when more than 300 men returned to work. The company said it was prepared to give an increase of 3d. an hour to skilled workers and 1½d. an hour to others employed in the toolroom. The men's union has agreed to discuss work study with the management.

IT IS EXPECTED that the Confederation of Shipbuilding and Engineering Unions will send a 140-strong delegation to the one-day conference on shipyard safety being organized by the Ministry of Labour at Newcastle an October 16. All sides of the industry are taking part. Mr. Ted Hill, the boilermakers' general secretary, will contribute a paper on behalf of the Confederation, the main recommendation of which will be the setting up of safety committees in all yards.

IMPROVED BENEFITS are to be paid to nearly 3,000 staff and works employees of the three companies of the Steel & Company, Limited, group, employed at Crown Works, Sunderland. They provide for a lump sum in cash for every employee on retirement equivalent to £10 for each year of service, and a cash payment of £400 to dependants on death or total disablement while in the companies' service. The benefits are in addition to those provided under the National Insurance Act.

The Scrap Markets

Restricted Demand from Steelmakers Continues

DEMAND for steelmaking scrap continues on a low and fitful note, as might be expected from the restricted rate of pig-iron and steel outputs. Customers are limiting their acceptancies to a minimum required by the fewer steel furnaces in operation and the corresponding reduction in activities at the blast furnaces has also brought less business for the balers of materials falling into this category.

There is no more than a fair demand for cast-iron scrap, although some foundries are still maintaining a steady call, but there is a better market for short heavy steel and machinery scrap.

Cleveland—Outlets for both iron and steel scrap tend to become even more limited in the present fluctuating state of the steel demand. This is having repercussions all along the line leading to raw materials, and the intake of scrap both at the melting shops and blast furnaces is limited and erratic. Consumers have good stocks backing up a reduction in scrap consumption.

There are rather better outlets for short heavy steel and No. 1 grade steel scraps together with black bundles, but the market for cast-iron scrap which contracted during the holiday period has not recovered its former buoyancy. Good tonnages of secondhand steel are being shipped from the Tees to Japan and the Far East for re-rolling processes there.

Scotland—The very strict quota imposed by the steelmakers has reduced the volume of trade very considerably and merchants are only operating at a fraction of their capacity. There are no signs, at the moment, of any improvement and it is to be hoped that there will be no worsening of the present position.

The production of steel turnings is about average but with the limited number of permit labels available, merchants are finding it extremely difficult to clear out this grade of scrap from the various supplying works.

The cast-iron foundries are taking in fairly good deliveries of all grades of cast-iron scrap.

South Wales—There is no demand for scrap of any grade or quality. Merchants who are carrying stocks in their yards find it impossible to unload them. The general position worsened with the August holiday period.

Steelmakers and ironfounders are intent on bringing down the stocks of scrap which they themselves hold rather than in allowing further stocks to pile. Labels are issued very sparsely.

Allied Ironfounders' New Sales Office

THREE sales divisions of Allied Ironfounders, Limited—the domestic appliance division, the bath division, and the electrical appliance division—move into a new three-storey building in Cadbury Road, Sunbury-on-Thames (Middx), on Monday.

Allied Ironfounders' main London headquarters and showroom remain at 28, Brook Street; the offices in Orchard House have been given up; and those at 18, Dering Street will continue to house the catering equipment division and export department. The telephone number of all departments at Sunbury is Sunbury-on-Thames 5577.

£250,000 Training Centre Opened by Pressed Steel

NEW £250,000 training centre, one of the largest built by a British engineering company, was opened at the Cowley, near Oxford, factory of the Pressed Steel Company, Limited, on Wednesday by Mr. W. J. Carron, president of the Amalgamated Engineering Union. The centre has been built to meet the growing need for managers, foremen, technicians, and craftsmen at Pressed Steel.

The centre is built on five floors, with machine shops, lecture rooms, library, and gymnasium. Ten instructors and 10 training officers are in charge of courses which will range from apprenticeship training to six months' courses for potential managers and two-year "executive development courses." The centre is supplemented by apprentice and supervisory training schemes at Swindon and Paisley, and shortly at Swansea.

MORE HARMONY NEEDED IN BRITISH SHIPYARDS

IF the same harmony between management and men could be promoted in the British shipbuilding industry as existed abroad, we could match the continental yards in price and delivery date, said Mr. Ernest Marples, Minister of Transport, when he returned from his tour of continental shipyards on Monday. He said he intended to contact British shipbuilding employers and to consult the Minister of Labour on an approach to the unions "to see if we can promote the same harmony here as there is abroad."

Mr. Marples said he was impressed by the lack of demarcation in the European shipyard labour forces and the flexibility of labour. "They have only a single union representing the men and it represents them very well."

Shop Steward Courses at Oxford

RESEARCH and instruction in industrial relations is being expanded at Oxford University, where the Delegacy for Extramural Studies has for some years been building up a background of experience of courses in industrial relations. Over the past 10 years the Delegacy has increased the scope of its activities to cover such industries as engineering, mining, etc.

The Delegacy, in full co-operation with the representatives of the Workers' Educational Association, the works committees, representatives of six trade unions, and the Pressed Steel Company, Limited, Cowley, is providing two courses for shop stewards during working time in the next 12 months. Both courses are of 16 weeks' duration, the first beginning on September 29.

JAMES HOWDEN & COMPANY, LIMITED, marine and general engineers, of Glasgow—Booking of orders during the year to April 30, 1961, was most encouraging, says Mr. C. W. Hume, the chairman, and at present the order-book of the parent company is at the highest in its history. During the year output from the Scottish factories was a record, he adds. Sales in France have been increasing and a French subsidiary is being formed. A controlling interest has been acquired in a new Dutch company, Holima Ingenieursbureau Voor Warmte- en Koudetechniek, established to take over the businss of the former agents in Holland.

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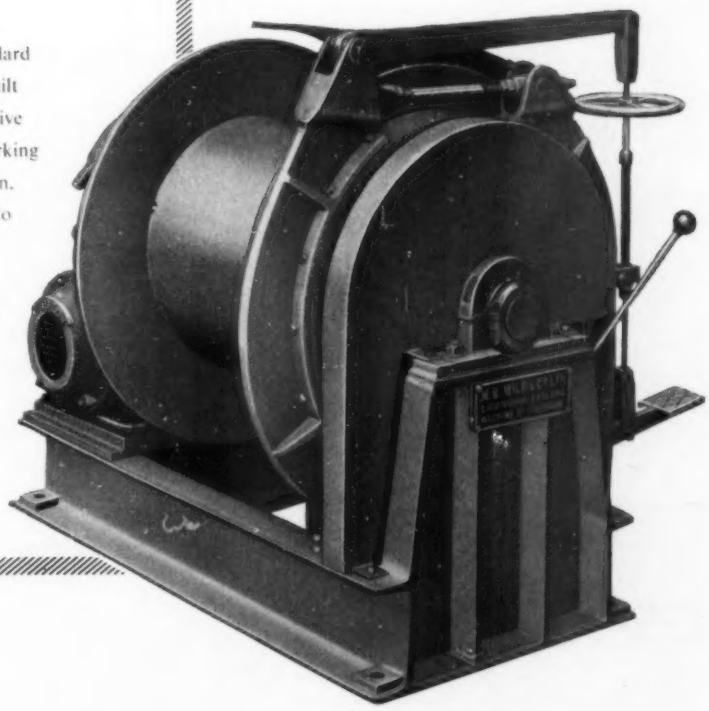

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BoT Journal's 75th Birthday

THAT there is "nothing new under the sun" (with the possible exception of men in space), is underlined by an editorial marking the 75th birthday of the Board of Trade Journal. The editor this week recalls that when it was decided to publish the Board of Trade Journal of Tariff and Trade Notices and Miscellaneous Commercial Information (its first title) there was a background of anxiety about the course of trade both at home and oversea.

"Britain, for so long the dominant figure in world trade, was entering a new era in which she was faced with increasing foreign competition and dumped surpluses, increasingly difficult entry into protectionist markets, and invasion of her home market by cheap foreign goods and foodstuffs." There was even a Royal Commission set up to examine "the causes of the depression in trade and industry and the pessimists were prophesying that England had run her course and was "done" as a trading and industrial community.

The following year Lord Rosebery, the Foreign Secretary, initiated a general inquiry among leading business men, trade associations, chambers of commerce, and Foreign Office representatives abroad. Out of this inquiry was born the Board of Trade journal.

It reported, significantly, that, in what some people still persist in referring to as the "good old days," the trade gap was £10,000,000. Today it is £50,000,000. But in 1886 exports were at about £19,000,000 a month and imports at 29,000,000—the gap representing about 20 per cent. of total trade. Today the gap represents just over 7 per cent.

With the alteration of a place name or two, many of the announcements in the Board of Trade Journal in its early days would still be valid today. How familiar is the following: "If any British firm, rich enough to wait, energetic enough to try, would send a clever Turkish-speaking agent specimens of machines with a large supply of spare parts, a staff of instructors and repairers, the whole to work gratis, if need be, for a time for advertisement, there might be a trade built up." A similar bait will probably be dangled 75 years hence—if there are any fish left in the pond.

Hungarians Increasing Rolled Steel Output

IMPROVEMENTS suggested by a foundry committee of the Mutual Economic Aid Council (Comecon) are expected to double output of Hungary's fine rolling mills at Diósgyór and raise production at the Ozd fine rolling mills by 30 per cent. within the next five years. Hungarian foundry technicians have added their own ideas to the committee's suggestions, and it is believed that without considerable capital investment national output of fine rolled goods can be increased by 56 per cent.

Re-equipment of the Lenin Foundry Works at Ozd, in Northern Hungary, is making good progress. Four of the new Marz type Martin furnaces are in production and a fifth should be in operation by the end of this month. Three more furnaces to be installed between now and next March should complete the new line two months ahead of schedule. To speed up analysis, quantum meters are being imported for use at Diósgyór and at the Csepel Steelworks in Budapest.

Winget's High Level of Orders and Sales

WHILE orders and sales of Winget, Limited, engineers and concrete machine makers, for the first quarter of the current year continued at a high level, the immediate future is overshadowed by the economic position at home, states Mr. R. Ducas, chairman, who adds, however, that the directors have every confidence in the longer term prospects. The major portion of the group's business is closely linked with the building and contracting industries, he points out, and while it is too early to assess the ultimate effect of recent economic restrictions, any reduction in the level of activity in these industries must inevitably lead to a fall in demand for plant and equipment.

Referring to last year's results he says that sales again achieved a substantial increase but the benefits were largely offset by a fall in profit margins due mainly to higher wages which had an inflationary effect on practically all items of cost. Group trading profits expanded from £268,688 to £308,941 in the year ended March 1, 1961, and the year's dividend is 12½ per cent. on the increased capital. The 1959-60 equivalent total was 13¼ per cent. taking a scrip issue into account.

Record Trading Surplus for Steel & Company

TRADING surplus of £1,276,471 reported by Mr. James Steel, chairman and managing director of Steel & Company, Limited, holding company for engineering concerns and cranemakers, etc., of Sunderland (Co. Durham), is the largest ever achieved. The balance of undistributed profit now totals £1,746,017 and the directors plan further capitalization of reserves to bring issued capital more into line with the net worth of the assets.

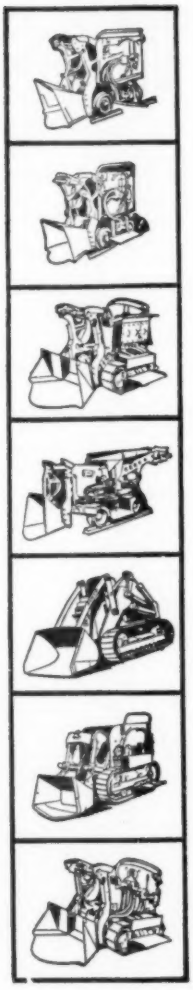
In spite of high tariff barriers, currency restrictions, and national prejudices, says Mr. Steel, the group has for many years competed successfully in world markets and he is confident that the company will gain more than it will lose by Britain entering the Common Market.

Plans to concentrate on the manufacture of cranes at the Sunderland factory are coming to fruition and the factory will be the largest mobile crane plant in the world.

WELSH STEEL OUTPUT DOWN IN AUGUST

PRODUCTION of steel ingots and castings in Wales and Monmouthshire during August amounted to 525,088 tons, an average of 105,017 a week over a five-week period, as compared with a weekly average of 122,580 tons for the five-week period in August, 1960. Pig-iron production for the same period was 379,628 tons, a weekly average of 75,925 (70,700) tons.

In South Wales and Monmouthshire steel production in August, 1961, amounted to 400,466 tons, a weekly average of 80,100 (96,000) tons over a five-week period. Pig-iron production for August, 1961, averaged 59,200 tons for the five-week period, 3,000 tons less than the weekly average for the five-week period in July, 1961, and 6,200 tons more than the five-week average for August, 1960.



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P3461

Richardsons, Westgarth Executive Moves

AT present with the UK Atomic Energy Authority, Mr. J. D. Glanville has been appointed a director of Richardsons, Westgarth & Company, Limited, marine, turbine, electrical, and general engineers, etc., of Wallsend-on-Tyne. He will assume the responsibilities of group production director at the beginning of October. Mr. W. R. Jones, at present managing director of George Clark (Sunderland), Limited, becomes group personnel director, and Mr. H. Watson-Jones, at present managing director of Richardsons Westgarth (Hartlepool), Limited, becomes group commercial director. Both remain directors of the parent company.

Rear-Admiral J. G. C. Given has resigned from the board and will cease to be managing director of the marine division of the group on September 30, when he leaves the company. From the same date the subsidiary companies (with the exception of Humber Graving Dock & Engineering Company, Limited) will become production units with centralization of the main functions at group headquarters, Wallsend, and will no longer come under the direction of individual managing directors.

Lower Capital Investment Estimate for 1961

CAPITAL investment by manufacturing industry in the UK in 1961 is expected to be 21 per cent. above its level in 1960, according to revised estimates issued by the Board of Trade. This is a downward revision of the estimated increase of about 30 per cent. made in January, and is largely accounted for by "significant downward revisions by companies in the motor vehicle industry." Capital expenditure by manufacturing industry last year was estimated to have totalled £1,034,000,000—a rise of 18 per cent. over the 1959 figure.

Investment in 1962 is expected to be about 2 per cent. below this year's estimated level, with the largest downward contribution expected by the iron and steel industry which this year is expected to reach a peak expenditure of more than £200,000,000 on expansion programmes.

Schools' Part in Reducing Accidents in Industry

GREATER attention to safety in the use of tools and appliances in schools is urged by Sir David Eccles, Minister of Education, in a memorandum to local education authorities, which draws attention to the accelerating rate of accidents among young people working in factories and similar employment. Last year accidents involving young people rose to over 12,600, and teachers are reminded of the part they can play in reducing this rate by introducing well-proved safety rules in the classroom.

Technical colleges and other establishments for further education are especially concerned, says the memorandum. Safety aspects of a subject should be developed as an integral part of the teaching. The teaching staff should also be thoroughly familiar with good industrial practice and—as a minimum—apply those provisions for safety required by the law in industry.

Increases of Capital

WILLIAM FIRTH (TOOLS), LIMITED, Leeds, increased by £4,900 in £1 ordinary shares, beyond the registered capital of £100.

GASCOIGNES (READING), LIMITED, increased by £750,000 in 2s. ordinary shares, beyond the registered capital of £250,000.

NUTS & BOLTS (DARLASTON), LIMITED, Darlaston, increased by £450,000 in £1 ordinary shares, beyond the registered capital of £50,000.

LAWRENCE BROS., LIMITED, metal merchants, etc., of Birmingham, increased by £63,000 in £1 shares, beyond the registered capital of £130,000.

GUEST KEEN IRON & STEEL COMPANY, LIMITED, Cardiff, increased by £9,500,000 in £1 ordinary shares, beyond the registered capital of £5,000,000.

WILLIAM C. PARKER, LIMITED, dealers in iron, etc., of London, N.9, increased by £19,000 in £1 ordinary shares, beyond the registered capital of £1,000.

H. G. BROOKER & COMPANY (WIREWORKERS), LIMITED, of London, S.E.15, increased by £5,000 in £1 shares, beyond the registered capital of £5,000.

BIFURCATED & TUBULAR RIVET COMPANY, LIMITED, Aylesbury, increased by £700,000 in 5s. ordinary shares, beyond the registered capital of £800,000.

POLLARD BALL & ROLLER BEARING COMPANY, LIMITED, London, W.1, increased by £700,000 in 4s. ordinary shares, beyond the registered capital of £800,000.

BRENTWOOD ENGINEERING COMPANY, LIMITED, Brentwood (Essex), increased by £10,000 in £1 ordinary shares, beyond the registered capital of £10,000.

J. HOSKIRK SONS & COMPANY, LIMITED, ironfounders, etc., of Bedford, increased by £60,000 in £1 ordinary shares, beyond the registered capital of £60,000.

MARKHAM & COMPANY, LIMITED, ironfounders, etc., of Chesterfield, increased by £150,000 in £1 ordinary shares, beyond the registered capital of £600,000.

SUTHERLAND PLANT COMPANY, LIMITED, machinery merchants, etc., of Salisbury, increased by £3,000 in £1 ordinary shares, beyond the registered capital of £1,000.

ANDERTON SPRINGS, LIMITED, engineers, founders, etc., of Bingley (Yorks), increased by £3,000 in £1 ordinary shares, beyond the registered capital of £6,000.

METALRAX (CONVEYORS), LIMITED, conveyor manufacturers, etc., of Birmingham, increased by £8,000 in £1 ordinary shares, beyond the registered capital of £2,000.

J. & S. ENGINEERS, LIMITED, mechanical engineers, etc., of Crayford (Kent), increased by £25,000 in £1 ordinary shares, beyond the registered capital of £85,000.

RANSOME & MARLES BEARING COMPANY, LIMITED, Newark on Trent (Notts), increased by £2,000,000 in 5s ordinary shares, beyond the registered capital of £2,000,000.

W. P. BUTTERFIELD (ENGINEERS), LIMITED, tank manufacturers, etc., of Shipley, increased by £499,900 in £1 ordinary shares, beyond the registered capital of £100.

TUSHINGTON METALLIC BRICK COMPANY, LIMITED, Huyton Quarry, nr. Liverpool, increased by £10,000 in £1 ordinary shares, beyond the registered capital of £10,000.

ROWE BROS. & COMPANY, LIMITED, lead sheet and pipe manufacturers, etc., of Bristol, increased by £100,000 in 5s. ordinary shares, beyond the registered capital of £950,000.

ENDECOTTS (FILTERS), LIMITED, ironfounders, mechanical engineers, etc., of London, S.W.19, increased by £55,000 in £1 ordinary shares, beyond the registered capital of £5,000.

C. H. EDWARDS, LIMITED, brassfounders, etc., of Millfields nr. Wolverhampton, increased by £100,000 in £1 ordinary shares, beyond the registered capital of £100,000.

SPIRO-GILLS, LIMITED, manufacturers of copper and steel-gilled tubes, etc., of Brighton, increased by £100,000 in £1 ordinary shares, beyond the registered capital of £100,000.

ELECO, LIMITED (formerly Engineering & Lighting Equipment Company, Limited), St. Albans, increased by £500,000, in 2s. ordinary shares, beyond the registered capital of £500,000.

GEORGE IBBOTSON, LIMITED, saw manufacturers, steel and tool merchants and manufacturers, etc., of Sheffield, increased by £75,000 in £1 ordinary shares, beyond the registered capital of £10,000.

DAVIS & HAMBLETT, LIMITED, manufacturers of and dealers in machine and other tools, of Longlevens (Glos), increased by £7,500 in £1 ordinary shares, beyond the registered capital of £1,000.

CHARLES WADE & COMPANY, LIMITED, iron and steel merchants and manufacturers, etc., of Birmingham, increased by £255,000 in 5s. ordinary shares, beyond the registered capital of £345,000.

DRAKE & GORHAM, LIMITED, electrical, mechanical, and hydraulic engineers, etc., of London, S.W.1, increased by £125,000 in 5s. ordinary shares, beyond the registered capital of £225,000.

NEWTON, CHAMBERS & COMPANY, LIMITED, engineers, ironfounders, etc., of Thorncliffe, nr. Sheffield, increased by £500,000 in £1 ordinary shares, beyond the registered capital of £3,000,000.

SATELLITE ENGINEERS, LIMITED, electrical and mechanical engineers, etc., of East Hoathly (Sussex), increased by £10,000 in £1 8 per cent. redeemable preference shares, beyond the registered capital of £11,000.

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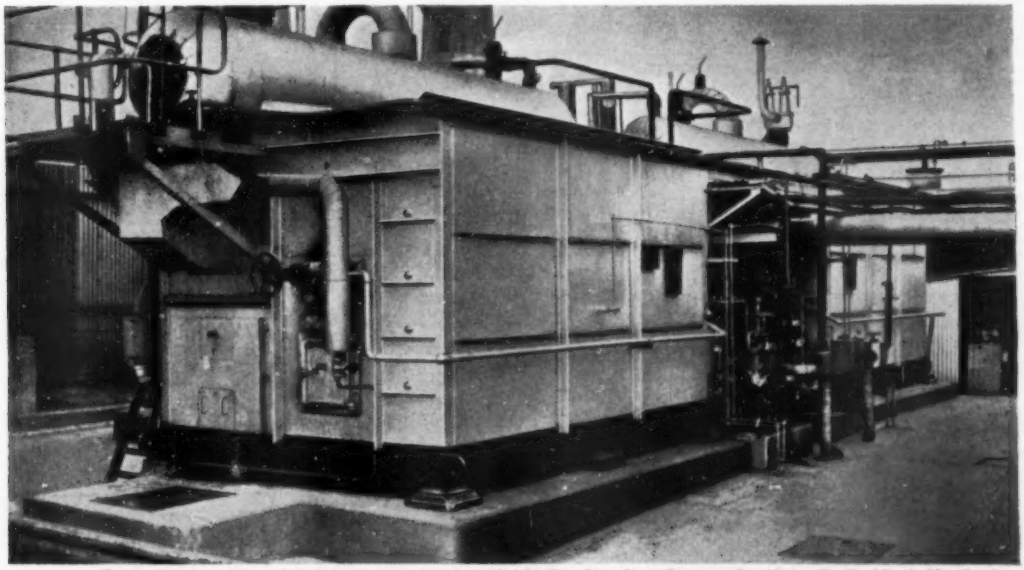
Temperatures up to 875°F.

These packaged steam generators offer substantial savings on installation, and generate high quality steam at low cost. They are highly efficient water-tube boilers designed to burn oil or gas separately, or in combination.
No accessories are needed: each boiler is supplied complete with its own fan, feedwater regulator, soot blowers, water column assembly and low water fuel cut-off, fully modulating combustion controls and automatic flame failure protection, and all necessary valves and fittings.
Although each of these units is complete in itself and ready for service as supplied, a range of additional equipment includes packaged economisers or air heaters, pumping and heating sets for fuel oil, control and instrument panel etc.
Full details of the Richardsons Westgarth — Foster Wheeler A.G. Series packaged steam generators will gladly be sent on request.



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Further particulars may be obtained from the REGISTRAR AND SECRETARY OF KING'S COLLEGE, to whom applications, together with the names and addresses of three persons to whom reference may be made, should be addressed so as to reach him not later than 31st October, 1961. Overseas candidates may in the first instance make application by cable.

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Complete with:— Foot Frames	2
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Flygt Pump Type B/150/200, 400/600 g.p.m., 140/130 ft., 75-68 amp. 400/440V., 1,450 r.p.m., 56 h.p. Serial No. 67865	1
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Flygt Pump Type B/200, 1,600/2,000 g.p.m., 60/30 ft., 71 amp., 420V. Serial No. 46711. **RECONDITIONED**	1
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Float Switches, Allen West No. F.125A, 39	2
EAC Auto Transformer Starters EAC Type 24QO Clat., 56 h.p., 50 cy. 3 ph. 346/400V. Serial Nos. L.309190 and L.265438	2
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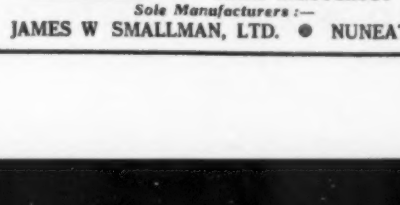
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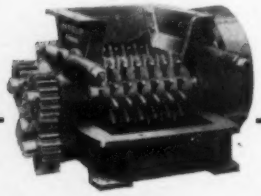

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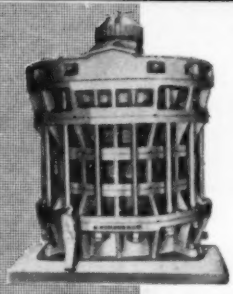

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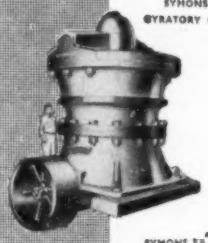

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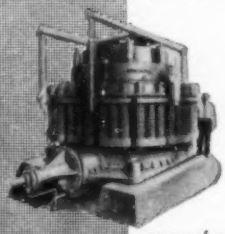

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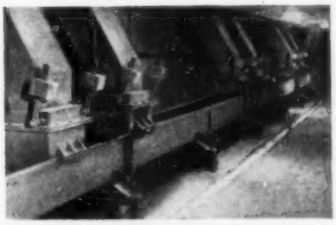

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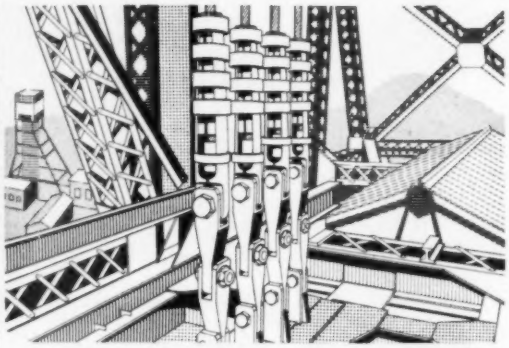

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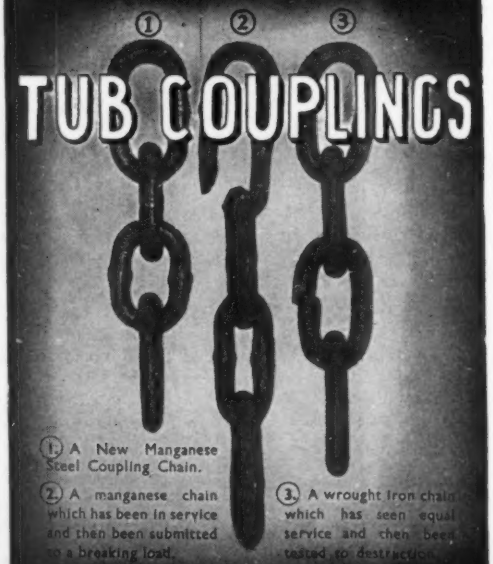

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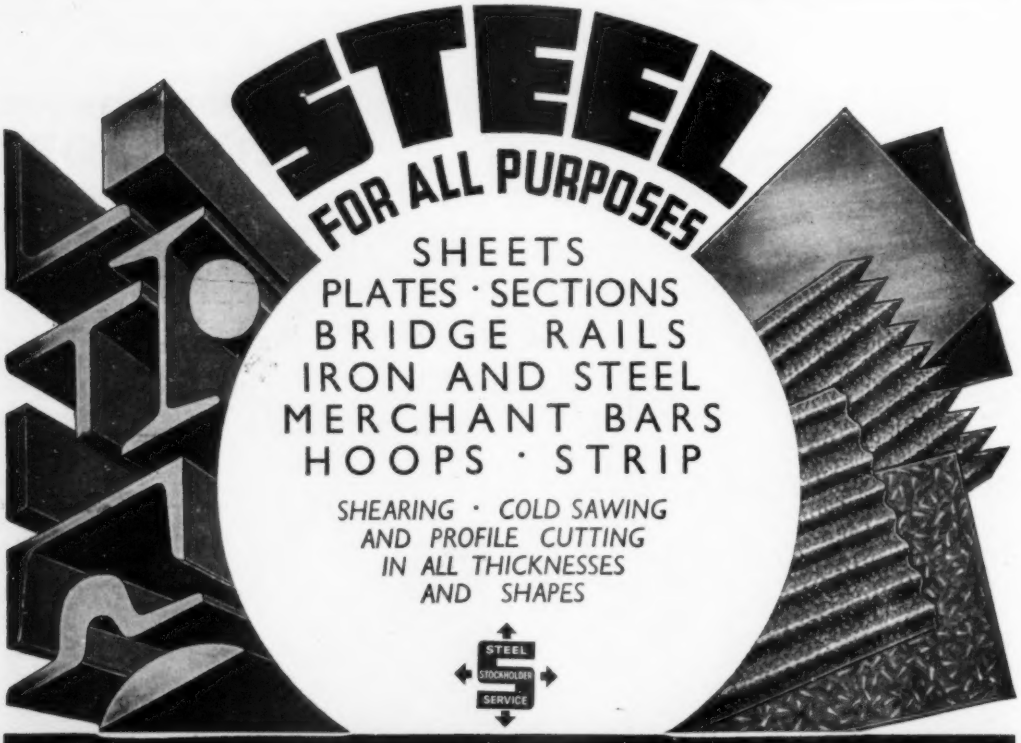

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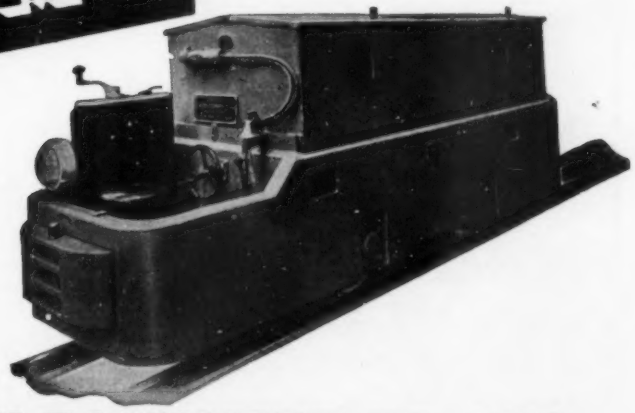

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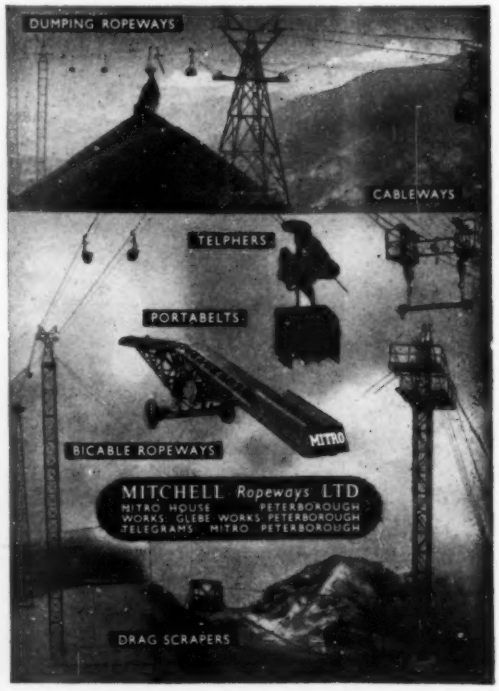

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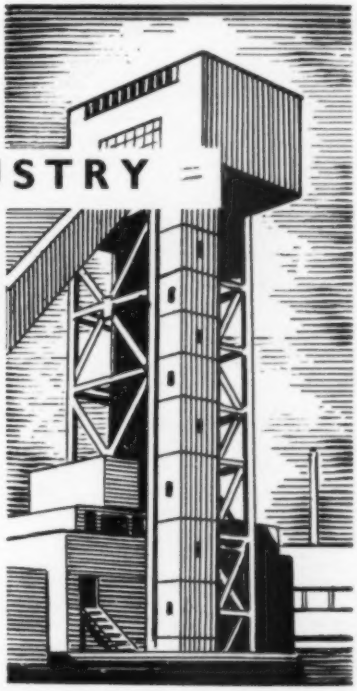

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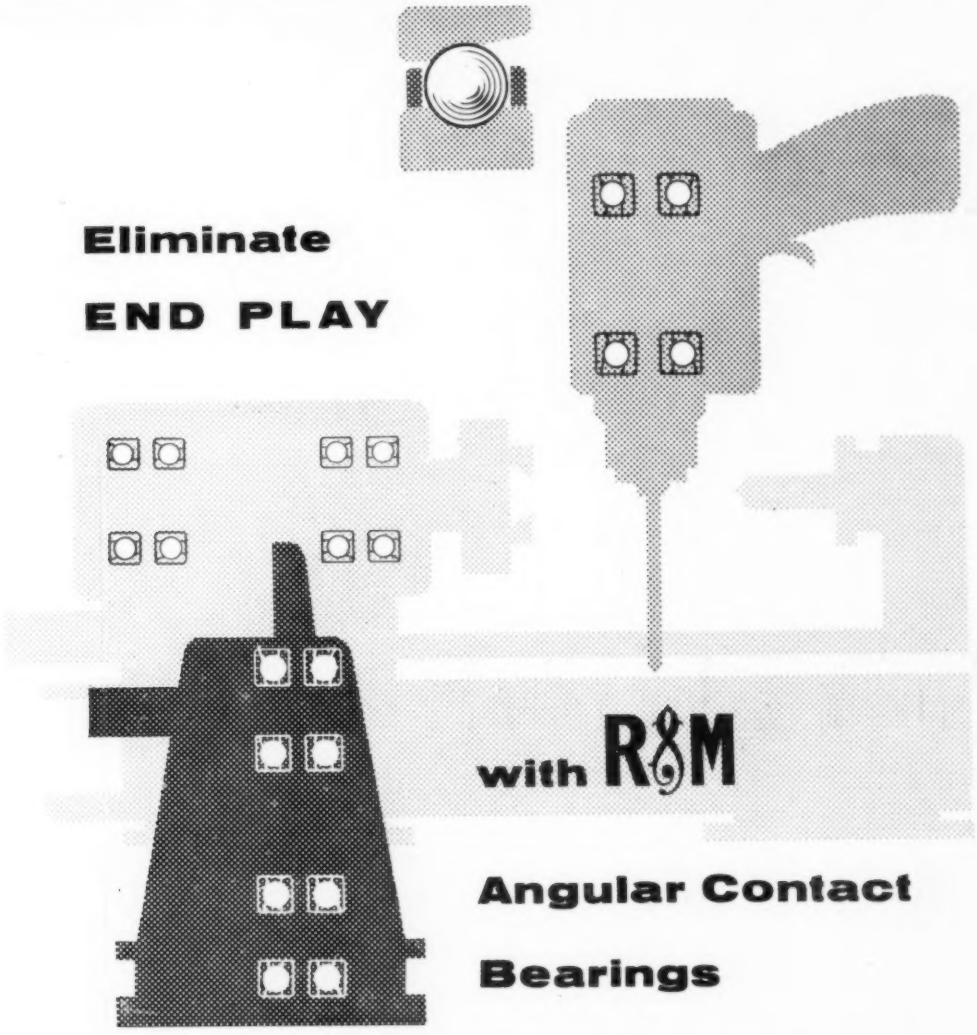

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